REPORT ON THE STATUS OF

TEACHER SUPPLY AND DEMAND

IN MASSACHUSETTS

MISER

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TEACHER SUPPLY AND DEMAND IN MASSACHUSETTS

7   PREPARED BY

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EXECUTIVE SUMMARY

Overview

The supply of teachers in the Commonwealth of Massachusetts will be adequate through 1991. Subsequently, however, the combination of increasing student enrollments, the anticipated attrition of the teaching workforce, and the predicted limits on drawing from the reserve pool of teachers will result in a shortfall. This potential shortfall has been measured, in this report, by the difference between the number of teachers who will be needed to maintain current prevailing student to teacher ratios and the number who will be available. The results of this study must be interpreted cautiously, given the tenuous relationship between student to teacher ratios and quality therein implied. Shortages that are predicted could be overcome if the State plans appropriately now to counteract them.

Data: Sources and Limitations

Much of the data utilized in this study has never been accessed or analyzed before. Data and sources include:

*Data on all teachers who have taught since 1971 in the Commonwealth in the public schools, from the Massachusetts Teachers Retirement Board.

*Records for each of the school districts in the Commonwealth showing hiring activity by years since 1979-80, reported in the Department of Education's annual October Reports.

*Information on all individuals who have sought certification in the Commonwealth since 1971, from the Department of Education's Bureau of Certification.

*A survey completed by 41 of the 47 Massachusetts programs of
public and independent institutions of higher education which
lead to teacher certification, collected by MISER.

*Data on the minority status of teachers in selected school
districts of the Commonwealth for the years 1982 through 1986,
collected as EEO-5 surveys, by the Department of Education for
the Federal Government.

*Data on student enrollments for each of the school districts
of the Commonwealth, from the January reports of the Department
of Education on school attending children.

This study has produced the first merger of the Massachusetts
Teachers Retirement Board data with the data of the Department of
Education's Bureau of Certification. This provided a unique source
of information which nonetheless left certain limitations that
constrained important aspects of the study. The integration did not
include information on salary for teachers, for example, which limits
the extent to which the responsiveness of teachers to wage changes
can be explored. The geographic location also was not recorded for
where active teachers are employed. As a result, teacher shortages
are not estimated for individual cities and towns even though we
believe these will in many cases, be more serious than for the state
as a whole. There are also no data linking individual teachers with
specific teaching assignments. Therefore an assessment of the
flexibility of current teachers to teach in areas of certification
other than their current assignment is limited. Information on course
taking behavior of students, in the public schools of the
Commonwealth was obtained from a survey of 2,898 secondary school
students conducted by the State Department of Education. The
limitations of that survey required imputation of much information
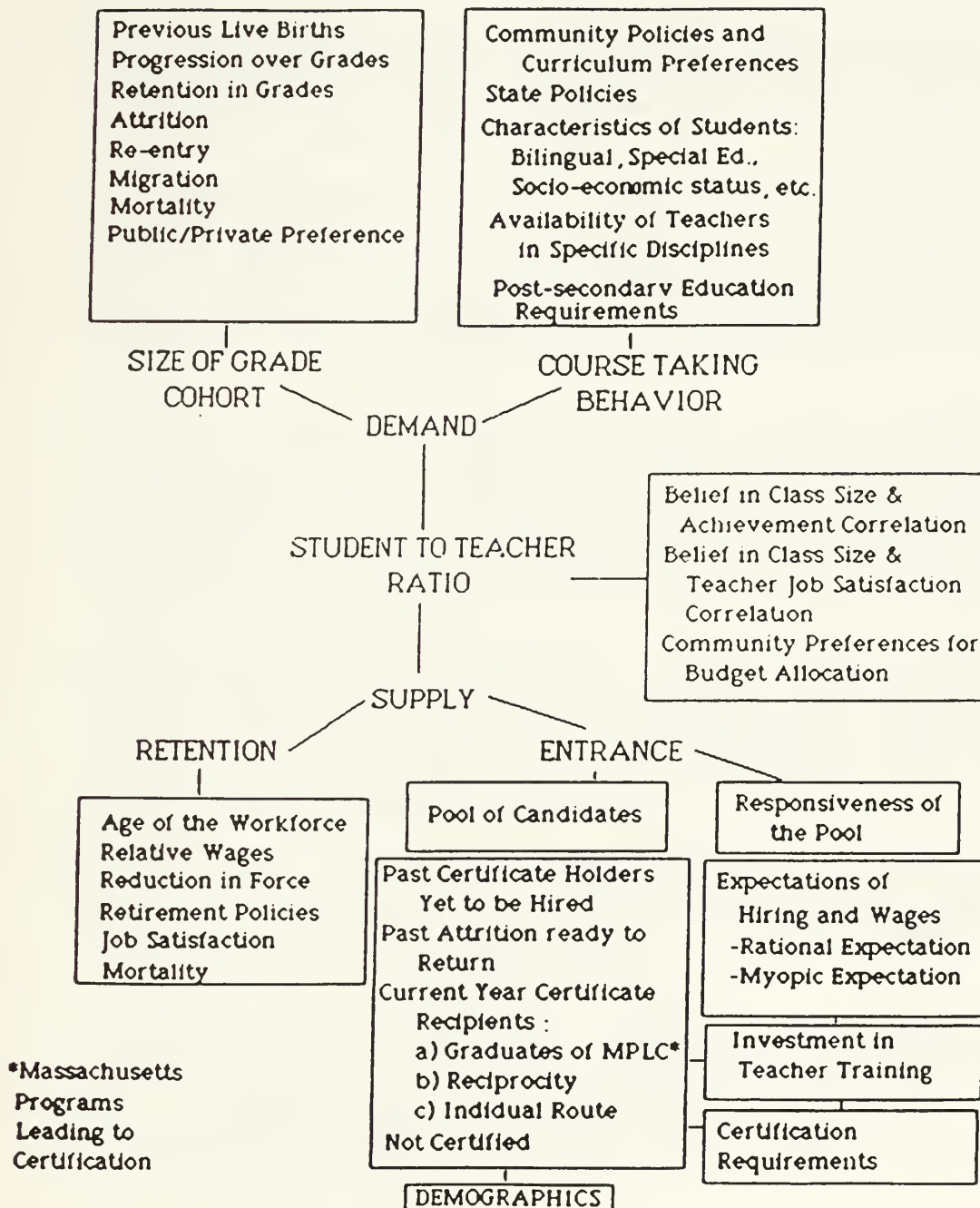relevant to curriculum necessary for completion of the study.

Further data limitations prevented an evaluation of the supply and demand of teachers in the Commonwealth's private schools which currently represent more than 10% of total school enrollments in the state. The study also does not evaluate supply and demand for teachers in schools that primarily offer vocational education. Finally the study does not attempt to assess the quality or competence of the teaching force.

Software of the Simulation System

A major product and innovation of this study is a computerized model which can simulate changes in certain conditions of teacher supply and demand in the Commonwealth. This model combines the integrated database with an understanding of the structure and behavioral characteristics of the system. The system is depicted on the following page. This model can simulate the impact of many policy initiatives including, for example, changes in the student to teacher ratio, changes in number of classes taught per teacher, changes in retirement policies, hypothetical changes in the curriculum required of students, changes in student attrition rates, and changes in the responsiveness of the reserve pool to enter teaching.

There is a significant discussion within the report about the residual affect of Proposition 2 1/2 on current conditions. The great impact of this event on the teacher supply and demand system has been easy to identify in the data. However, to estimate the magnitude of the result of a future event like Proposition 2 1/2 is beyond the scope of this report.

TEACHER SUPPLY & DEMAND
SYSTEM

Previous Live Births	Community Policies and
Progression over Grades	Curriculum Preferences
Retention in Grades	State Policies
Attrition	Characteristics of Students:
Re-entry	Bilingual, Special Ed.,
Migration	Socio-economic status, etc.
Mortality	Availability of Teachers
Public/Private Preference	in Specific Disciplines
	Post-secondary Education
	Requirements

SIZE OF GRADE   COURSE TAKING
COHORT   BEHAVIOR

DEMAND

STUDENT TO TEACHER
RATIO

> Belief in Class Size &
>   Achievement Correlation
> Belief in Class Size &
>   Teacher Job Satisfaction
>   Correlation
> Community Preferences for
>   Budget Allocation

SUPPLY

RETENTION   ENTRANCE

	Pool of Candidates	Responsiveness of
		the Pool

Age of the Workforce	Past Certificate Holders	Expectations of
Relative Wages	Yet to be Hired	Hiring and Wages
Reduction in Force	Past Attrition ready to	-Rational Expectation
Retirement Policies	Return	-Myopic Expectation
Job Satisfaction	Current Year Certificate	
Mortality	Recipients :	Investment in
	a) Graduates of MPLC*	Teacher Training
	b) Reciprocity	
	c) Indidual Route	Certification
	Not Certified	Requirements

*Massachusetts
Programs
Leading to
Certification

DEMOGRAPHICS

Major Findings

ABOUT ENROLLMENTS:

1. Total enrollments in the Commonwealth reached their peak in 1974 at 1,183,028 students and are expected to decline by 31.6% through 1990, amounting then to only 809,402 students. Beyond this point, total enrollments will rise through 1995.

2. The primary grade enrollments, kindergarten-6, have already reached their minimum at 414,281 in 1985, declining 34.2% from their earlier peak of 629,147 in 1974. The onset of decline in the primary grades was synchronous with the decline of total enrollments.

3. The secondary grades, 7-12, began to decline later than the primary grades, the turning point occuring in 1976 with 560,454 students enrolled. Secondary enrollments will reach their lowest level at 350,451 students in 1991. This is six years after the bottoming of the primary grades. This total decline, over the longer period, is expected to be about 37.5%.

4. Points 1 through 3, above, convey a crucial facet of the shift in demand for teachers in the near term future. The depression in enrollments that is now moving through the system implies that relative cohort sizes will generate a situation in the 1990's in which too few teachers will be produced by colleges to match already swelling primary and secondary enrollments.

5. Enrollments vary by geography. From 1980 to 1985, the period when the number of towns and cities which declined was at its maximum, total enrollments fell in 314 of the State's 351 towns and cities. In the same period, 302 communities had declining primary enrollments and 295 had declining secondary enrollments.

6. The number of communities with declining secondary enrollments reaches its maximum in the 1985 to 1990 period when 321 communities are expected to have reduced enrollments in the upper grades.

7. Because of the variability in enrollment changes among communities, more difficulty in securing a sufficient workforce is anticipated in some areas than that foretold by an aggregate State model of demand and supply. Shortages are likely to occur in some places at times when others have sufficient supply.

ABOUT THE TEACHING WORKFORCE:

8. The teaching workforce has already fallen from its peak of
   73,559 in the State in 1977 to 62,225 in 1986. In selected
   teaching fields, the numbers of teachers may fall yet
   further because of declining students.

--AGING:

9. The average age of the workforce increased from 36 years of
   age in 1973 to 42 years of age in 1985. This aging is
   expected to continue.

10. The aging of the workforce, coupled with Proposition 2 1/2,
    has greatly diminished the participation of the young in
    teaching in the Commonwealth. There has been a 91.5%
    decline in the youngest cohort, aged 20-24, and a 83.7%
    decline in the number aged 25-29, each over the time period
    from 1973 through 1985.

11. The aging process has been exacerbated by three ancilliary
    factors: the age of new hires in the system has increased
    from 27 to 31, of first time certification recipients from
    25 to 28, and of persons "stopping out" of the system
    (ceasing temporarily from working as a teacher for a period
    of a year or longer) from 31 to 37.

--RETENTION AND ATTRITION:

12. From 1973 through 1985, the workforce has been composed on
    average of: 92% teachers continuing with service; 3%
    teachers returning from a stop out of a year or more; and
    5% newly hired individuals. Retention of the current
    workforce has been central to our current success in
    meeting demand.

13. There has been a trend in increased attrition for all age
    groups from 1973 to 1985. These rates increased
    dramatically in the year of Proposition 2 1/2, the highest
    rates being for teachers of ages 20-24 and ages 25-29.

14. Aging in the teaching workforce exacerbates the impact of
    attrition, although the increase in attrition rates only
    becomes noticeable for teachers of ages 50-59 and, then
    more pronounced for teachers between 60 and 64 and over 65.

15. Although attrition by age cohort has increased, there has
    been an historical decrease in aggregate attrition. This
    is because the bulk of the workforce has become
    concentrated in the middle age categories where the
    age-specific attrition is lowest. Attrition will become a
    more significant problem beyond the current study period
    (which ends in 1995) because the middle aged cluster of
    teachers now in the workforce will begin to experience
    significant attrition due to retirement.

16. Attrition rates seem highest, recently, for art studies, special education, bilingual, and foreign language teachers. It has been lower for the sciences, chemistry and biology (although physics is relatively high) and the early and elementary and middle school teaching certification holders. These data do not support the popular concept that science teachers are drained away in large quantities by non-teaching job offers.

17. The declining size of the teaching workforce was created by a failure of entrants to keep pace with attrition. It is at this margin that adjustments to the gross size of the teaching force are made. This is an important facet to watch. Only in the post-Proposition 2 1/2 years of 1982-84 has the entrance to attrition index moved upward, undoubtedly a reaction to the significance and swiftness of the cuts enacted as immediate responses to the tax-cap.

ABOUT THE STUDENT TO TEACHER RATIO:

18. Despite reductions in the teaching workforce, the student to teacher ratio has declined continuously in the study period, except for the one year interlude due to Proposition 2 1/2 in 1981. The student to teacher ratio has fallen by 3.1 students per teacher, from 16.7 to 13.6. It increased by about .7 students per teacher as a result of Prop 2 1/2.

ABOUT THE EFFECTS OF PROPOSITION 2 1/2:

19. Proposition 2 1/2 had a dramatic effect in increasing stop out behavior, depressing hiring and retention, as well as increasing the average age of the workforce.

20. Proposition 2 1/2 has probably had the effect of shielding the Commonwealth from the vicissitudes of the current national teacher shortfalls by increasing our current reserve pool, but it also will exacerbate shortages in the 1990's because of the increased attrition of the young (see points 10 and 13, above).

ABOUT SUPPLY AND DEMAND BALANCE:

21. The supply and demand for teachers is most appropriately evaluated by certification categories of teachers. Only at this level of detail, do shortages appear. Analysis at the aggregate level, makes the system seem more stable than it really is. This is because impulses at the elementary level counterbalance shortfalls at the secondary level when certification categories are not considered.

22. The conditions of supply and demand for teachers by certification categories can be broken into four basic groupings:

(1) an area that has current and chronic likely
        shortages--bilingual;
    (2) areas with initial surpluses which are followed by
        shortages that show up by the early 1990's--English,
        general sciences, mathematics, biology, chemistry,
        social studies and vocational studies;
    (3) areas unlikely to experience either shortages or
        surpluses of any great magnitude--early childhood
        and elementary and middle school teachers;
    (4) areas likely to have no future shortages but which
        have some near term, modest surpluses--French,
        Spanish, and other languages. This is paradoxical
        given the bilingual education dilemma.

23. A reasonable consideration on the part of the State and its
    school districts is to maintain teachers through periods
    with potential surpluses to help defray anticipated, later
    shortages.

24. The cost of decreasing the student to teacher ratio in the
    Commonwealth by even a single point would be $136 million,
    annually. This is sufficient to require further analysis
    of whether such changes embody sufficient quality shifts to
    justify such costs.

ABOUT PROGRAMS LEADING TO CERTIFICATION:

25.   Only 15.7% of the graduates of the programs surveyed were
      hired in Massachusetts.

26.   Of the graduates of Massachusetts programs leading to
      certification recorded in this study's survey, only 53.6%
      received certification in Massachusetts after graduation
      and only 29.3% of those certified were hired. Over time,
      this record will improve because the graduates of 1982-85
      who were surveyed may yet become certified and may be hired
      at future dates.

27.   Productivity in programs leading to certification seems
      comparable in both the public and the independent higher
      educational institutions. 56.5% of public program
      graduates were certified and 30.1% of those certified were
      hired as teachers in Massachusetts. By comparison, 50.3%
      of the independent college program graduates were hired and
      28.1% were hired.

28.   Only 425 of the 2154 persons newly hired in the
      Commonwealth in 1985 were graduates of Massachusetts
      programs over the years, 1982-85.

ABOUT DRAWING FROM THE RESERVE POOL:

29. Certification holders have been hired as many as twelve and
    thirteen years after the date of their initial
    certification. Of the total persons ever hired from that
    group of persons earning first certifications in 1972, for
    example, .6% were hired in 1984, twelve years later and .7%
    were hired in 1985, thirteen years later.

ABOUT RESPONSIVENESS OF SUPPLY:

30. The capacity of the system in Massachusetts to provide
    teachers is much greater than what has been observed
    historically. This is apparent both in the low percentage
    of those hired from higher educational institutions
    offering training which leads to certification and in the
    extreme duration of individuals in the reserve pool who can
    be drawn into active teaching, long after their initial
    certification.

31. The teaching supply has appeared very responsive to the
    demands on the system. This is reflected by the fact that
    first certification recipients track the recent hiring of
    teachers. The more who are hired, the more who opt to make
    teaching a potential career. Prior hiring explains 94.9%
    of the change in the numbers of first certifications
    earned.

32. SAT scores of individuals from Massachusetts expressing
    preferences for teaching as an occupation are relatively
    low, 43rd in the nation in a ranking of states. This gives
    rise to concerns about quality, a matter largely outside
    this report.

33. That supply follows prior hiring is defined as myopic
    behavior. Such behavior magnifies the cyclical supply
    response to shifts in demand. Promulgating information on
    future teaching needs will allow potential teachers to form
    rational expectations based on forecasts of future needs
    rather than prior hiring. Such information could eliminate
    most of the potential for future crises.

34. The responsiveness of teachers' supply is influenced
    significantly by wage rates in teaching relative to other
    wages. This has not been studied extensively in this
    report, but independent empirical work shows a strong
    teaching supply response to wage changes.

35. Geographical analysis focusing on wages from neighboring
    states would show difficulties caused by competition with
    bordering states.

ABOUT MINORITY BALANCE:

36. While enrollments of white public school students in the
    Commonwealth fell by 23.7% from 1979 to 1985, enrollments
    of minorities rose by 7.4%. Asian students doubled and
    hispanic students increased nearly 45% in this period. The
    percentage of minority students enrolled in the
    Commonwealth has increased from less than 12% in 1979 to
    almost 16% in 1985.

37. The decline of 3406 black students enrolled in public
    schools between 1979 and 1985 was almost perfectly offset
    by an increase of 3027 enrolled in private schools.

38. There are 32 school systems in the Commonwealth with
    minority enrollments greater than 10%. Only 4 of the 32
    school districts experienced decreases in their minority
    enrollment percentages from 1979 to 1985.

39. For the 32 school systems with more than 10% minority
    enrollments, 24 were covered in the EEO-5 surveys. Of
    these, minority enrollment to minority teacher ratios
    varied widely: from more than 300 to 1 in schools with the
    lowest proportional representation of minority teachers to
    23 to 1 in Boston with the highest proportionality. In all
    cases, the minority student to teacher ratios were
    significantly higher than student to teacher ratios for
    whites.

40. Only 19 of the Massachusetts programs leading to
    certification reported on minority status of their
    graduates. Of those that did, the percentage of graduates
    who are minorities appears to have declined from 13% to
    about 6% over the period, 1982 to 1986. The percentages of
    minorities hired from programs leading to certification
    were less than percentages of minority graduates. This
    implies either a bias in the teaching system against hiring
    minority teachers or greater job opportunities for minority
    college graduates who consequently choose not to enter
    teaching.

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During the past year of work on this study, numerous people have contributed their help and support in the process of analyzing teacher supply and demand in Massachusetts. Each contribution has been important to this effort.

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An advisory committee comprised of representatives of the Governor's Education Office, the Massachusetts Teachers Retirement
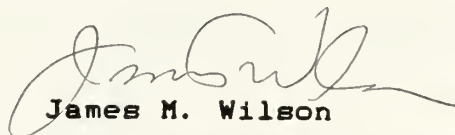
staff associate at MISER, Professor Hariharan Swaminathan, and Dean Mario Fantini offered additional guidance.

MISER staff and graduate research assistants were crucial to various parts of the project. Christine Payne was technically responsible for integrating the MISER college and university survey, the Bureau of Certification, and Massachusetts Teachers Retirement Board data files. She also prepared preliminary statistics on the stopout behavior of teachers and wrote the appendix on data structures. Dana Rigali, a graduate assistant at MISER, helped design, program, and debug the study software. She helped manage and tabulate the MISER survey of programs leading to certification (with Dale Finn another graduate assistant). Ms. Rigali also helped write a manual on the study software and researched other state supply and demand models. Hans Helgeson, former MISER student research assistant, wrote and programmed the forecasting section of the study software. Catherine Lerme, MISER staff assistant, conducted the analysis of the minority data, tabulated the EEO-5 data (with help from Ira Grolman, a student assistant), and produced all of the maps in the report. Linda Downs-Bembury coordinated meetings, pulled together many details on the study and helped with final production of the study report.

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PREFACE

The main body of the report is presented in three parts:

1). The initial section presents an historical overview of teacher supply and demand in the Commonwealth, the structure of the system and relevant controversies concerning its measurement, statistics on teacher supply and demand, and the forecast for teacher supply to the year 1995.

2). The next section analyzes minority enrollment and staffing for the Commonwealth in primary and secondary grades, as well as providing statistics on minorities graduating from teacher edcuation programs.

3). The final section provides recommendations for what data should be collected to improve the reliability of information concerning teacher supply and demand, and how that data might best be collected.

Appendix I describes the integrated database created by MISER to provide data to monitor teacher supply and demand in the Commonwealth.

Software which simulates various aspects of the teacher supply and demand system was also created for this project. Documentation concerning that software is provided under a separate cover.

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Part I: TEACHER SUPPLY AND DEMAND

Chapter 1: INTRODUCTION TO TEACHER SUPPLY AND DEMAND

Increases in total enrollments, increasing minority enrollments, the aging of the active teaching force, the potential depletion of the reserve pool with the decline of traditional college graduates, and salary competition from other states are current sources of concern for policymakers. The confluence of these historical trends portends the possibility of a "teacher shortage", an inadequate supply of teachers given demand, or enrollments, in the educational system. The major implications of a shortage are that class size, for some subjects, will increase, relative salaries of teachers may change, and existing resources and facilities may be inadequate. Popular opinion asserts that such results will lower achievement by students, lower the morale of teachers, create concern on the part of parents, and drive educational costs significantly upward. This report will estimate the magnitude of changes in teacher supply and demand in the coming years, and will review the empirical evidence concerning the measured qualitative effects of changing class size on student achievement and teacher morale. The review of the studies concerning the student to teacher ratio is important for policymakers. The entire notion of a

"shortage" or "crisis" devolves, in some sense, to that measure. Certainly a crisis exists when there are no teachers for particular subjects; however, identifying a shortage becomes less certain when class size changes within a certain range.

Beyond the difficulties that may arise due to the concurrence of these trends is the serious disequilibrium that can occur with the changing health of the state economy or a change in preferences in allocating income for public expenditure as witnessed with Proposition 2 1/2. Such "shocks" can create massive attrition, as well as new attitudes about the quality of the educational system as measured by the student to teacher ratio. If the economy and preferences are stable, the historical trends discussed still hold the potetnial to produce a disequilibrium in the teacher supply and demand system. With the added uncertainty of shocks, the importance of understanding the meaning of these trends and the notion of a "teacher shortage" become critical. An introduction to the teacher supply and demand system will be presented in the next section, which provides an overview of the trends and shocks over the last 14 years.

Chapter 2: HISTORICAL OVERVIEW

Introduction

An historical view of the teacher supply and demand system as a whole is provided in this section to acquaint the reader with the past behavior of the fundamental components of the system: retention, hiring, enrollments, and the student to teacher ratio. The aim of this presentation is to show how demographic and economic events influenced teacher supply and demand, and how shocks, at times, played a greater role in the condition of the system than trends.

Enrollment Trends

Enrollments provide the starting point for examining the system. Figure 1 shows the steady downward trend in total enrollments since 1974. Figure 2 shows the trend for the primary grades, K through 6, as well as the trend for secondary grades, 7 through 12. The trends in these two most important cohorts are not synchronized, indicating disparate demand conditions for primary versus secondary grades. Clearly, the system, during this period, experienced the anamolies resulting from the decline and rebound, over the last 30 years, of live births (Figure 3).

Employment Trends and Shocks

One would expect that employment in teaching would follow an analogous downward trend. However, Figure 4 shows that this is not the case. Years 1974 to 1977 show an increasing trend in employment in the face of a total drop in enrollment. From then until 1980, both employment and enrollment fell, but enrollment fell faster than employment of teachers. In 1980 to 1981, there was continuing secular decline in the enrollment numbers, but a precipitous decline in the number of teachers. This drop was concurrent with the fiscal austerity of Proposition 2 1/2. Following this, from 1981 to 1985 enrollments continued their established pace of decline; employment, however, was reasonably constant. Figure 5 shows the total enrollment to total employment ratio (a rough facsimile of the student to teacher ratio). From 1972 to 1980 and again from 1981 to 1985, there is an evident trend in reducing this ratio. This trend persists even with declining employment over the years 1978 to 1980, because enrollment fell faster than employment during this time continuing to reduce the enrollment to employment ratio. The specific contributions to the employment picture of retention, hiring, and past teachers returning to the system (which shall be termed "stopouts") are shown in Figure 6. Hiring and retention both decline, and stopouts show a modest increasing trend. There are, again, some obvious discontinuities at the time of implementation of Proposition 2 1/2. However, Figure 7

reveals that entrants (hiring plus stopouts) outpaced
attrition for a number of years and given the decline in
total enrollments, the enrollment to employment ratio fell.

Trends_in_Total_Enrollment_to_Total_Teacher_Employment_Ratio

The enrollment to employment ratio is but one of many
measures of the "quality" of the educational system.
Contemporaneous with the historical trend in this measure,
for example, was the trend in the decline in SAT scores for
education graduates. The focus on the enrollment to
employment ratio does not assume that it is the primary or
best measure of the quality of the educational system. A
subsequent section will show how the student to teacher
ratio, an analogous measure, is quite controversial.
However, this measure is ideal for monitoring the
relationship of supply with demand in the aggregate. It is
important to note that the Commonwealth continued to
increase the quality of education, which arguably shall
henceforth considered to be measured by the enrollment to
employment ratio, even during a period of high unemployment.
The unemployment rate in 1975 was greater than 11 percent
(Figure 8). The economy subsequently recovered and by 1979,
the unemployment rate was virtually half what it was in
1975. However, the unemployment rate began to increase
again in 1980. Given that current economic stress, the
memory of a recent period of high unemployment and the
"Zeitgeist" which embodied an ideology founded on the belief
in the reduction of the size of government spending, it

becomes understandable how Proposition 2 1/2 occurred. The average community per capita expenditure for schools during this period was 35% of local tax revenue.*1 Schools were an obvious target for this change in preference toward fiscal austerity. The historical committment to increasing quality in education, as measured by the total enrollment to total employment ratio was implicitly questioned. The retrograde behavior of the enrollment to employment ratio shown in Figure 5, indicates this change in preference. Table 1 shows how attrition severely outpaced entrance in 1981 and Figure 9 shows the great drop in retention for that year. Proposition 2 1/2 had the effect of moving the system toward enrollment to employment levels that were present in 1978, three years previous. A linear regression was estimated to capture the time trend and the shock of Proposition 2 1/2 on the total enrollment to total employment ratio. This estimation indicated that the system reduced this ratio by .26 points per year; however, the shock of "2 1/2" reversed the otherwise monotonic trend. During the shock, the ratio increased .72 points over the time trend.*2

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*1 Page 15,Thomas, Susan, Catherine Flynn, George McDowell, Carole Camp, "How Massachusetts Towns Spend Their Money," Department of Food and Resource Economics, University of Massachusetts, Cooperative Extension, January 1981.
*2 Statistics on the regression:
    ratio = 17.1 - 0.26 * time + 0.72*(Prop 2 1/2)
            (0.17) (0.19)   (0.27)
    F = 88.63   R2=94.6.

Post Proposition 2 1/2

Economic conditions and the prevailing ideology, it is hypothesized, temporarily changed the public's preference for allocating funds to public primary and secondary education. Figure 5 indicates, however, the effect of Proposition 2 1/2 has been, in terms of the enrollment to employment ratio, largely counteracted. The ratio in 1984 is lower than in 1980. This reduction in the ratio results, primarily, from the continued decline in enrollments in the period and, as Table 2 and Figure 7 show, hiring and attrition were closely aligned. This kept total employment at a relatively constant level, since 1983, after Proposition 2 1/2.

Summary

This cursory analysis provides an overview of the trends and shocks in the teacher supply and demand system over the last 17 years. This examination of the history of aggregate teacher supply and demand indicates that economic shocks played a dominant role in the activity of the system. The issues of aging, relative wages, the demographic decline of traditional college graduates, and many other matters were not addressed in this historical overview. The report will examine, in detail, the historical behavior of the system, and the historical trends that will play a role in determining the future. The subsequent section will describe

the components and determinants of activity in the teacher supply and demand system. Empirical evidence from secondary sources will be presented to illuminate popular conceptions about the student to teacher ratio, teachers' salaries, salary competition with other states, etc.

Chapter III: THE STRUCTURE OF THE TEACHER SUPPLY AND DEMAND

SYSTEM

Introduction

This chapter outlines the components and analyzes the determinants of the teacher supply and demand system. Empirical studies from secondary sources will be presented to critique popular opinions about various measures used to monitor the condition of the teacher supply and demand system.

Components of Teacher Supply and Demand

The components of the teacher supply and demand system are the size of the grade cohorts and course-taking behavior which shapes demand, the number of teachers retained from the previous period, the preferred student to teacher ratio, and the number of entrants needed, to maintain the current preference for the level of the studen to teacher ratio. The number of entrants needed can be expressed by the equation:

Number of Entrants Needed by Subject	Enrollment by Subject	Student to Teacher Ratio by Subject	Retention [3] in the Subject

$$N = E / S - R.$$

The demand for entrants is positively related to changes in enrollments and negatively related to both the changes in the student to teacher ratio and retention. Demand, or enrollment by subject area is positively related to the size of the grade cohort. These components are depicted in Figure 10.

Determinants_of_the_Components

The components are determined by numerous factors, as shown in Figure 11. A discussion of the issues relevent to these determinants of the components is presented below.

I._Size_of_the_Grade_Cohort

Live_Births

The primary determinant of the size of the grade cohort is the number of live births in Massachusetts the relevent number of years previous. This is shown graphically in Figures 12 to 24; and even though the report deals primarily with only public schools, these figures show enrollment data are for both public and non-public schools. The distance between the live births line and the grade cohort line can

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[3] Given: $S = E / (N + R)$; then $S *(N + R)= E$; and $N + R = E / R$; and thus $N = E / S -R.$

be accounted for by mortality, net migration, progression over grades, retention in grades, attrition, and re-entry.

Progression/Retention, Attrition, and Re-entry

Progression, retention, attrition, and re-entry are correlated, in part, with the characteristics of students. Figure 25, reproduced from the Condition of Education 1985, for the entire U.S., indicates how student characteristics affect attrition. Re-entry rates are, likewise, influenced by student characteristics as shown in Figure 26. Progression, and its complement retention, it is hypothesized, would follow similar patterns for student characteristics. Note that progression, retention, attrition, and re-entry will also be influenced by the degree of difficulty of the curriculum. Attrition and grade retention will be positively correlated with increasingly demanding curricula, while progression and re-entry will be negatively correlated. Nationally, the student attrition rate has dropped from 28.1 percent in 1980 to 25.9 percent in 1984*4. Massachusetts experienced a small reduction in student attrition from 26.9 percent in 1980 to 26.2 percent in 1984, in the later period somewhat above the national average.

Preference for Public versus Private Education

An additional factor, when considering demand for public schools, is the preferences for public versus private

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*4 page 9, U.S. News and World Report, June 2, 1986.

education.   This changing preference is shown in Figure 27.
The characteristics of parents, it is hypothesized, are the
most likely predictors of whether a student will attend a
public or private school.   The parents sending students to
private schools,   it has been reported, may be characterized
as having: "...relatively fewer children, higher edcuation
levels, more likely in white collar occupations and usually
intact, two parent families."*5   No attempt was made to
model these prefernces in this study, though such estimates
would be very useful in refining teacher supply and demand
estimates.

II. Course_Taking_Behavior

The courses a student take creates the demand for
teachers trained in particular areas.   In general, the range
of choice for course-taking for students in the primary
grades is very restricted, while a fair range of choices is
open to students in secondary grades.   The design of the
curriculum for schools resides, for Massachusetts, primarily
with the community and only partly with direct state
control. The state requires 1 year of American History and
four years of physical edcuation in a high school program.
The choice of courses is left largely with teachers and
students in the secondary grades*6.   Thus, there is a great
variety of curricula operating in the state.   Further it has
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*5 Page 74, "Condition of Education, Massachusetts",
Massachusetts Department of Education, 1985.
*6 Page 32, "The High School Experience in Massachusetts",
Department of Education, April 1986.

been noted   that secondary education in Massachusetts, over
the set of communities, may be described as showing: "
differential access to coursework; lack of a common core of
knowledge presented to all students as a result of
programmatic and academic tracking; substantial variation
among courses assigned the same title due to dilution of
course content; ... substantial variation in course content
from school to school*7" and that "a high school diploma
lacks any singular meaning*8."   Thus, making any
generalizations about curricula and course-taking is
tenuous.

III._Student_to_Teacher_Ratio

The student to teacher ratio is the fundamental measure
used in this study to monitor the relationship between
supply and demand. However, it is a controversial measure.
Intuitively it would seem that lowering class-size would
unambiguously increase student achievement and improve the
quality of work for teachers. Empirical studies, however,
show ambiguous and counterintuitive results.

Student_Achievement_and_Class_Size

Eric Hanushek catalogued the results of 112 studies
which examined the affect of the student to teacher ratio on
student acheivement*9.   Of the 112 studies, 89 produced

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*7 Ibid., page 31.
*8 Ibid., page 32.
*9 Page 1161, Hanuschek, Eric, "The Economics of Schooling:
Production and Efficiency in Public Schools," Journal of
Economic Literature, Vol. XXIV, September 1986.

results indicating that there was no statistically significant realtionship between the student to teacher ratio and student achievement. Of the 23 that did produce a statistically significant result, 14 shows a negative relationship (that achievement increased with class size) and 9 showed a positive relationship.

Another study, often cited, was conducted by Gene Glass and Mary Smith.[10] These researchers examined the results of over 300 studies to try to synthesize, via "meta-analysis", a common set of findings. Studies with high degrees of experimental control were culled from approximately 300 studies. About 100 comparisions were made over the studies. The result of this work was the construction of an intuitively appealing relationship between student achievement and class size (Figure 28). This graph relates percentile rank in student achievement with class size. This relationship indicates that there are 33 percentile ranks between the level of achievement of an individually taught student and a student taught in a class of 40. These results were controlled for grade level, subject taught, and the ability of students, none of which, they concluded, affected this relationship. Glass and Smith's work was criticized by the Educational Research Service[11], which said that the results were biased by

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[10] Page 14, Glass, Gene U., and Smith Mary Lee, "Metaanalysis of Research on Class Size and Achievement," Education Evaluation and Policy Anal., 1979, I(1).
[11] page 13, Larkin, Anthony I., John Keeves, "The Class Questions: A Study at Different Levels of Analysis," Monograph #26, 1984.

atypical class size (1 or 2 students), the comparisions ulitmately came from only 14 studied--only 6 of which came from typical classroom situations, and the methods used hid study-specific distinctions by combining statistically distinct data. Glass, et al, responded by repeating the study, ommitting classes of size 1, and the curve remained of the same shape. They defended the use of a small database, emphasizing that the poorly controlled studies (those ommitted from the analysis) produced the same results as the well-controlled ones. They also asserted that by systematically classifying the results they had clarified, not hidden, the distinctions. What is not revealed in the Glass and Smith work is the reason why small classes make a difference. Not identifying such factors implies that this was a source of variation not controlled for in their work. Anthony Larkin and John Keeves sought to discover the classroom practices which make a difference in small classes. They criticize previous studies, particularly Glass and Smith, for not isolating the factor associated with smaller class sizes and achievement gains. In their study they:

...sought to identify those classroom practices, teaching behaviors and teacher characteristics which are significantly different for small classes when compared to large classes and then attempt to establish which of these factors are associated with superior achievement levels.*12

The results of their work showed that classroom practices did not vary greatly with class size and that classroom

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*12 Ibid., page 14.

practices that were observed to change with class size had little influence upon achievement outcomes. They concluded that this was because:

Reducing class size did not lead to dramatic changes in classroom practices. Instead, the teacher's own individual style appeared to be the main factor determining classroom activities. It seems teachers had not been taught how to exploit the opportunities that small classes provided and that teacher training concentrated upon the development of skills appropriate to classes of 25 or more students. *13

If any conclusions can be drawn from this diversity of results, it is that it is not clear how class size will systematically affect student achievment. Larkin and Keeves suggest that:

The reasons why a particular class size should produce achievement gains or losses still remains obscured by the diversity of activities, personalities and materials available in a single classroom. *14

Hanushek concludes:

There is little apparent merit for schools to pursue their ubiquitous quest for lowered class size...Yet, policies that take schools outside the bounds observed could lead to different results. For example, class size between 15 and 40 students fall well within the data; classes of 2 students or 300 students do not...and they may show significant relationships with achievement. *15

This conclusion is in accord with the results of Glass and Smith. The curve they constructed ranges from about 2 to 40 students per class. The most dramatic changes in percentile rank occur in class size ranges 2 to 20; percentile rank changes in this range by 30 points. Changes

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*13 Ibid., page 78.
*14 ibid., page 82.
*15 Op. cit., #9, page 1167.

from 20 student to 40 students in classrooms are accompanied by only 5 points change in percentile performance rank of the students. If this relationship is assumed to be valid, the challenge facing policymakers is the evaluation of the tradeoff between marginal changes in achievement and marginal changes in cost when considering the student to teacher ratio.

Teacher Job Satisfaction and Class Size

The effect of class size on teacher job satisfaction is another question. The implicit question is whether "large" class size will cause teacher attrition or discourage teacher candidates. In the "Survey of American Teachers" it was reported that 79 percent of the teachers surveyed indicates that providing small class size would "Help a Lot" to encourage teachers to remain in teaching, and only 1 percent said it would "Not help at all."*16 In another question, 18 percent of primary school teachers indicated that class size was a very serious problem and 31 percent thought that it was somewhat serious. When questioned about what made teachers think about leaving, 8 percent said "class size". A recent survey by the Massachusetts Teachers Association reports that 88 percent of the teachers polled believe that class size should be reduced *17. It is

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*16 page 18, Louis Harris and Associates for the
Metropolitan Life Insurance Company, "Survey of the American
Teacher," New York, April-June 1985.
*17 page 8, "Issues and Opportunities: Survey Findings, The
Massachusetts Teachers Association, Boston, May 1987.

important to note that class size can be reduced by increasing the number of classes taught. It is hypothesized that such an increase in the workload would be negatively correlated with job satisfaction.

Budget Allocation and the Student-Teacher Ratio

The student to teacher ratio is also affected by community preferences for budget allocation. As Figure 5 showed, Proposition 2 1/2, a change in such preferences, temporarily reversed the previous trend of a decline in the ratio for the general edcuation workforce. This suggests that given the "softness" of this measure in terms of empirical results, the evaluation of this measure is vulnerable to changes in preferences for public spending.

IV. Retention

Age of the Teacher Workforce

The age of the teacher workforce affects retention particularly through higher attrition rates for older cohorts. This is confirmed by Figure 29 which indicates the rates of retention for the 5 year age cohorts in the year 1985. Further, as reported in the Massachusetts "Retirement Law Commission Composite Actuarial Valuation, as of January 1, 1983," attrition will occur for the older cohorts at certain "target" retirement ages such as 55, 62, 65 and 70 (Figure 30 show 100 percent of those retiring). Younger age cohorts are shown to have even higher attrition rates than

older cohorts. However, the concern in looking into the
future with the attrition of older cohorts is due to the
fact that a disproportionate number of the teaching
workforce will move into the older age cohorts in the near
future.

Relative Wages: Wage Competition from Other Professions

There is concern that teachers have low salaries and
that this creates the potential for attrition of the
teacher workforce. Such attrition is specifically expected
if occupations requiring comparable training increase their
wages relative to teaching.

A study by the U.S. Department of Education, Office of
Educational Research and Improvement reports:

Elementary and Secondary teachers are not leaving at a higher
rate when compared to other professional occupations requiring
similar preparation for entry level positions; and...transfers
into teaching are no greater than transfers out for both
elementary and secondary teachers. [18]

A survey reported by C. Emily Feistrizer examined how
responsive teachers would be to offers in other professions
that included salary increases. The results showed that:

When teachers...were asked if they would leave teaching if given
the option of making $2000 more per year in another job, around
70 percent.. said they would keep their teaching jobs...When
given the option of a $5000 a year increase in another job,

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[18] Bulletin OERI, "Teacher Job Entry, Separation, and
Transfer Rates," U.S. Department of Education, Office of
Educational Research and Improvement, Washington, D.C.,
November, 1986.

around half of the teachers...said "I would keep my teaching job."*19

Though these were reported as evidence that the "majority" of teachers would stay in the profession and an indication of salary and job satisfaction, 30 percent or 50 percent reductions in force, given the appropriate market conditions, would be severe losses of teachers, comparable to implementing another Proposition 2 1/2.

The "Survey of Teachers" reported that 94 percent of the teachers surveyed thought that providing a decent salary would help retain teachers, and 62 percent said that inadequate pay has made them think about leaving teaching.*20 A recent survey by the Massachusetts Teachers Association indicated that 72 percent of Massachusetts teachers believe their salaries are not appropriate to their professional responsibilities and level of preparation. *21

The_180_Day_Work_Year_and_Teachers'_Salaries

The relative wage of teachers is difficult to assess because teachers work 180 days per year rather than the 250 days per year for the average worker. Feistrizer reports that a poll conducted by Gallup in 1985 indicated that the general public thought that a teacher with 15 years experience and a college education should earn $29,000 if

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*19 page 19, Feistrsizer, C. Emily, "Teacher Crisis: Myth or Reality? A State-by-State Analysis 1986," National Center for Education Information, Washington D.C., 1986.
*20 Op. cit. #16, page 30.
*21 Op. cit. #17, page 6.

they were a secondary school teacher, and $27,000 if they were a primary school teacher. In 1984 the average salary of secondary school teachers was $24,276 and primary school teachers earned $23,092. Adjusting these salaries to a 250 day year, the salary for a secondary school teacher is $29,131; the salary for a primary school teacher is $28,255. These numbers, indeed are comparable to the Gallup results*22. Clearly, how one values the short work year for teachers affects how one perceives the relative salary of teachers. Feistritzer reports a NCEI survey indicating that 84 percent of the teachers hired in the last five years said they agreed with the statement: "Even if I could make more money teaching 12 months out of the year instead of 9 or 10, I'd rather just teach 10 months."*23 The "Survey of Teachers" reported that 19 percent of the teachers, when asked what made them stay in teaching, responded: "Summers off, good vacation."*24

Neighboring States and Teachers' Salaries

Relative wage competition from other other states for teachers is of concern in the Commonwealth. Table 5 shows the average wages for Massachusetts and 12 neighboring states.*25 Both nominal income and income for the cost of

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*22 page 11, Press Release: " A Gallup Survey Conducted for the National Education Association," July 1, 1985.
*23 Op cit. #19, page 20.
*24 Op cit. #16, page 48.
*25 page 12, Nelson, F. Howard, Jewell C. Gould, Julie Silverwood, "Survey and Analysis of Salary Trends 1986," Research Department of the American Federation of Teachers, Washington, D.C., JUly 1986.

living are presented. The states are ordered by the salary
after the cost of living adjustment. The District of
Columbia, Rhode Island, New York, Pennsylvania, and Ohio
have salaries, on average, greater than Massachusetts. The
greatest difference is between the District of Columbia and
Massachusetts, a sum of $5,401. However, Massachusetts has
a greater salary than New Jersey, Maryland, Connecticut,
Delaware, Maine, Vermont, and New Hampshire. Table 30 shows
the states from which individuals sought to obtain
reciprocity certification in Massachusetts. These data do
show that geographic proximity is important. To fully
understand the meaning of these data, the relative
importance of salary would have to be controlled for the
original residence of the applicants (Massachusetts'
residents attending schools in other states would be part of
these data), and the effect of distance.

Job Satisfaction

The reported job satisfaction of teachers has been
falling. Teachers reporting that they would certainly enter
the profession again if they could start "all over" dropped
from 53 percent in 1966 to 24 percent in 1983.*26 However,
C. Emily Feistrizer reports that:

...a greater proportion of all teachers reports higher levels of
satisfaction with the job/work than do college graduates
generally (who, in turn report higher job satisifaction than the

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*26 page 169, "The Condition of Education," edited by Valena
White and Joyce D. Stern, U.S. Department of Education,
Washington, D.C., 1985.

general worker), teachers with less than ten year's experience report the highest levels of satisifaction. More than 9 out of 10 (90.2 percent) of the teachers with 5 to 9 years of experience. and 87.8 percent who have been teaching less than five years say they are satisified with their jobs, compared with 80.9 percent of those with 15 to 19 years' experience, and 81.5 percent of the group with 20 to 24 years of experience. *27

In terms of retaining teachers, the "Survey of Teachers" reported that the dominant factor, reported by 40 percent of those surveyed, was the relationship with students. "Love to teach" was indicated as a reason by 27 percent, "Satisfaction in seeing students grow, progress", by 23 percent, "Summers off, good vacation" by 19 percent *28.

Teachers, however, are likely to behave rationally when weighing the various non-monetary incentives with the monetary incentives. J.R. Antos and S. Rosen developed a model to test the relationship between the non-monetary and monetary incentives and found, not surprisingly, that teachers were willing to receive a lower salary in exchange for positive characteristics of schools, and demand higher salary in exchange for tolerating negative school characteristics*29.

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*27 These results come from the National Center for Education Information's survey of 1,592 public and private school teachers conducted February 7 to April 15, 1986. The results are for 1114 public school teachers sampled (Reported in Op. cit. #19).
*28 Ibid. page 16.
*29 Antos, J.R., and S. Rosen, "Discrimination in the Market for Public High School Teachers,: Journal of Econometrics,3, May 1975: 123-50.

Certification, reciprocity recipients, or those going the individual route), and those hired on waivers without certification. It is hypothesized that the responsiveness of these groups is contigent on the demand in the educational system and the opportunity wage available for such individuals.

The factors which influence how individuals choose a profession is a complicated matter and will not be discussed here. However, to aid this study, a number of simplifying assumptions must be made. The primary assumption is that individuals are rational. They will observe the signals from the teaching labor market and adjust their expectations accordingly. A second assumption is that, because training is required to teach, individuals will rationally invest time in obtaining skills appropriate to the signals of market demand.

Expectations

A key aspect to both the responsiveness of the reserve pool and the investment of individuals in training to be teachers is their expectations about the demand for teachers in the system. Expectations may take, fundamentally, two forms: the shall be termed myopic expectations or rational expecatations. Myopic expectations are formed based on recent past activity. Thus individuals with myopic expectations would look at recent past years of hiring as the best indicator of future demand and based on that

activity would make the choice to train for teaching or to become certified. Individuals with rational expectations consider predictions about the market demand in shaping their behavior. Thus individuals with rational expectations will look at forecasts of teacher demand and based on this information make a choice about preparing to become teachers or becoming certified.

In his study, "Occupational Choice: An Application to the Market for Public School Teacher"*31, Gary Zarkin modelled the certification behavior of teachers from 1955 to 1979 using national data. He found that elementary school teaching candidates used myopic expecations, while secondary school teaching candidates used rational expectations, i.e, the elementary school teaching candidates read the market signals in the previous period and respond, while secondary school teaching candidates read the forecasted signals 4 years in advance and respond. These results were estimated for a turning point in demand which peaked and then declined. The coming turning point in Massachusetts enrollments will be of the opposite trend: a decline and then an increase. Whether Zarkin's expectations model will hold in that case is untested.

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*31 Zarkin, Gary A., "Occupational Choice: An Application to the Market for Public School Teachers," Quarterly Journal of Economics, John Wiley & Sons, Inc., N.Y., 1985.

Responsiveness_to_Wages

There is concern that the entry wages for teachers is
inadequate. Feistrizer reports that salaries for beginning
teachers are the best they have been since 1978, and are
competitive with business administration graduates after one
adjusts the teacher salary for a 250 day working year.*32
Other comparisons are less sanguine. The American
Federation of Teachers study on salaries indicates that the
starting teacher salary, although improving, does not
compete well with other professions.*33 The looming
question, however, is: if there was a salary increase how
responsive is the labor market for teachers? Gary Zarkin,
using national data estimated a wage elasticiy of supply
which indicated that if salaries for elementary school
teachers were raised 10 percent, there would be an 8.1
percent increase in the number of people willing to work as
elementary school teachers.*34 A 10 percent increase in the
wages for secondary school teachers would increase their
supply by 7.2 percent. This indicates that responsiveness
exists, but it is not very strong. These results show that
a percentage point increase in salary produces less than a
percentage point increase in the number of individuals

*32 page 36, Feistritzer, C. Emily, "The Condition of
Teaching, A Statae by State Analysis, 1985." The Carnegie
Foundation for the Advancement of Teaching, Lawrenceville,
N.J., 1985.
*33 Op. cit. #25, page 14.
*34 page 19, Zarkin, Gary, "The Importance of Economic
Incentives in the Recruitment of Teachers," National
Institute of Education, Technical Report 143, February 1985.

wanting to enter teaching. That is, there is still significant enough movement in the numbers of teachers with changes in teacher salaries that we must be concerned over salary levels.

Size of the Pools

The size of the pool is a different issue that is the responsiveness of the pool. The size of the pool refers to the number of eligible candidates; the responsiveness refers to the activity of these potential candidates in seeking current employment. The size of the pool is determined by the number of past certificate recipients who have yet to be hired, the number of past teachers who have left the system, current certificate recipients (from either Massachusetts programs leading to certification, reciprocity certification, or individual certification), and the individuals that may enter the system with waivers of certification or as apprentice teachers.

Certification, Quality of Teachers, & Increased Demand

Facing a potential increase in total elementary and secondary school enrollments and a decrease in traditional college graduates, policymakers concerned with improving the quality of edcuation as measured by the aptitude of entrants to the teaching profession have a difficult choice to make; this involves this issue of certification Certification requirements are a means of screening individuals so as to

produce a minimum level of competence for teachers. Certification is an attempt to select "good" teachers through the proxy of a particular set of credentials. There is controversy over whether these requirements really are appropriate, whether they are an adequate screening device, and whether they actually work adversely to discourage "talented" candidates from entering teaching. There is concern over the declining quality of teachers as measured by their academic performance. A National Institute of Education study found that only 7.9 percent of the college graduates in the top 20 percent of the S.A.T. scores went into teaching, while 28 percent in the bottom 20 percent entered the field*35. It is further reported that 61 percent of all teachers come from the lower 40 percent of academic achievement*36. Eric Hanushek examined 106 studies investigating the relationship of teacher education to student achievement*37. Only 11 of the 106 found a statistically positive relationship; 5 were negatively related, and 69 found statistically insignificant results. C.Emily Feistritzer flatly asserts that, "The criteria for certification to teach often has little to do with demonstrated competence to teach"*38. The "Survey of Teachers" asked those in the profession what they thought

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*35 Study quoted from The American Teacher by C. Emily Feistrizer in "Quality of Teacher Education: A Crisis Revisited," WICHE, 1985.
*36 page 12, Berland, Lisa, "Teachers: A Question of Competence," State Legislatures, February 1983.
*37 Op. cit. #7, page 1161.
*38 Op. cit. #19, page 31.

would improve the quality of teachers. Paradoxically, 97 percent thought it would be helpful to upgrade certification standards and 69 percent thought that a master's degree in the subject area would make a difference *39.

The problem for policymakers of a potential shortage of teachers is that certification stands as a controversial barrier to entry into the teacher labor market. Pressure may increase, with the shortage, to "lower" this barrier. The question then of how to guarantee minimum competence will need to answered. Also note that the signal for a crisis, increasing class size, is not any less controversial a matter.

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*39 Op. cit. #16, page 22.

Chapter IV: DEMAND: HISTORICAL STATISTICS AND FUTURE TRENDS

FOR ENROLLMENTS AND COURSE-TAKING

Introduction

Demand for teachers is created by the size of the enrollment of the student body, their course-taking behavior, the student to teacher ratio, and the retention of teachers from the previous time period. This section will examine the trends and the data for enrollments and course-taking. Subsequent sections will present trends and data concerning retention and the student to teacher ratio.

Enrollments: Historical Trends

Total enrollments for public schools has been on the decline since 1974. These have been shown before in Figure 1, but Figure 31 extends the historical trends in total enrollments to show the MISER demographic forecasts *40. From 1975 to 1980 total enrollments dropped 13.4 percent from 1,172,029 to 1,015,165; from 1980 to 1985 total enrollments dropped another 16.9 percent from 1,015,165 to 843,151. In constrast from 1985 to 1990, the MISER forecasts show that while total enrollments will decrease stil another by 4 percent, and then from 1990 to 1995, total

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*40 See Appendix III for a technical description of the forecast.

enrollments finally begin to increase, rising by 8 percent. Disaggregating the total enrollments into primary grades (K through 6) and secondary grades (7 through 12), shows that the trends for these cohorts are not synchronous. Figure 29 depicts the separate trends in enrollments in primary grades and secondary grade total enrollments for the years 1970 to 1995.

Turning Point in Total Enrollments

One of the most critical elements in the total enrollment forecast is that the system will experience a "turning point" in demand. This is expected in 1990. The turning point for the primary grades has already occurred in 1985; the turning point for the secondary grades will not occur until 1991, when the large primary grade cohort begins filtering into the secondary grades. The change for the primary grades from 1985 to 1990 is an increase of 9 percent; the change for secondary grades is a decrease of 15 percent (Table 4). Historically, we have not seen such turning points (peaks or troughs) frequently. In the early 1950's the original baby boom increased demand. Again a turning point occurred in the early 1970's when demand began to decline because of the decrease in births. These are our only experiences with turning points since World War II.

Variation_in_Historical_Enrollment_Trends_over_the_State

The enrollment trends vary by town and city in the Commonwealth. Figure 32 shows the total enrollments by community for the Commonwealth in the year 1985. Figure 33 distinguishes the 314 of the 351 communities in the Commonwealth that experienced declines in total enrollment from 1980 to 1985. For the primary grades, 302 communities declined (Figure 34) and for secondary grades 295 communities declined (Figure 35). Figures 36 to 38 show the changes in enrollments for each commnunity for total, primary, and secondary enrollments, respectively.

Variations_in_Forecasted_Enrollment_Trends_over_the_State

If these trends persist into the future, there will be great shifts in the grade cohorts. Figure 39 shows the communities forecasted to experience increases (119) and decreases (232) in total enrollments between 1985 and 1990. Figure 40 shows the change for the years 1990 to 1995: 73 communities are expected to decrease, and 278 increase. Figures 41 through 44 show how this forecasted change will effect the primary and secondary grades for the two period of change delineated in the future. Primary grades will show increases for 285 communities from 1985 to 1990, and increases for 265 communities from 1990 to 1995. Secondary grades will show declines for 321 communities fror. 1985 to 1990, and will the show increases for 223 communities from

1990 to 1995. Figures 45 to 50 show more detail of the size
of these these changes by community for all the categories
presented.

Course Taking: Sources of Data

Data on course-taking for public primary and secondary
education is confined, primarily, to a single report,
"Course Taking Among Massachusetts High School Students"
*41.   The report addresses only high school course-taking,
not grades 7 or 8, nor the primary grades. This report,
based on a sample questionnaire answered to by 2898 students
from a diverse set of communities, sought to answer such
questions, relevant to this report, as: "How do student
distribute their coursework among subject areas ?;... and
What particular pattern of coursework exist among
Massachusetts students? *42" The results of that study have
been quite useful to this endeavor, some of which shall be
presented below.

Figures 51 through 56, reproduced from the report, show
the distribution of percentages of students taking
coursework in a particular area for a given number of years.
Table 5 shows the percentage of high school students taking
a particular number of years of coursework for various
subjects.   These data provided the basis for allocating the
students in grades 9 through 12 to particular subject

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*41 "Course Taking Among Massachusetts High School
Students", June 1985, Department of Edcuation.
*42 Ibid., page 1-2.

areas. There were 13 aggregate areas--those areas chosen by consultation with the funding agencies as the most important to the study-- relevant to secondary education, used in this teacher supply and demand study. The data from the "Course-taking" report provided estimates for 8 out of the 13 areas*43. The percentage participation for the balance of the categories for the secondary grades, and for the primary grades as well, were estimated from anecdotal data collected from discussions with a number of superintendents, teachers, and students.

For grades 7 and 8, a general curriculum, with full participation in mathematics, english, general science, and social studies was assumed. For the areas of art, physical edcuation, special education, vocational studies, bilingual, and the non-teaching categories such as administrator, media specialist and librarian, and counseling, percentages of each grade were allocated.

Estimates of Course Taking

Table 6 shows the distribution of percentage participation, that was assumed for this study, for each grade for all 20 categories. The resulting enrollments by the twenty areas for the historical years 1981 to 1985, and forecasted years 1986 to 1995, are show in Table 7. These estimates are created simply by applying the course-taking

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*43 The thirteen categories, over all grades, are: English, mathematics, general science, biology, physics, chemistry, social studies, French, Spanish, other languages, health studies, art studies, and vocational studies.

participation matrix to total enrollments by grade. The course-taking percentages assumed and shown here were held constant over the historical and the forecast period, while the grade cohort size changed given the demographic trends. The decline in enrollments in the secondary grades can be seen in the subject areas traditionally associated with secondary education. Figures 57 to 73 show these enrollments graphed for the 20 subject areas.

Changes in Community Preferences for Curriculum

It is important to note that the trends in demand which are reported here are derivative only of two things: course-taking behavior and the size of grade cohorts. These trends can be disrupted, obviously, by changes in other things as well, such as the curriculum preferences of communities which alter the curriculum. Shifts in such preferences was, no doubt, witnessed once, for example, when Proposition 2 1/2 took effect. Table 8 shows the retention rates, derived from October Report data, for the 20 aggregate categories, ranked from the lowest to the highest for the year 1981, the year of Proposition 2 1/2. The teaching force in the arts and languages, the data seem to indicate, were reduced by far greater percentages than technical areas. That this data agrees little with the traditonal retention rates within the same subject areas and that there was little hiring at the time to offset this attrition in art, libraries, and languages suggests that the

financial exigencies brought out preferences to cut in these
areas and less in other areas.

Chapter V:THE SUPPLY OF TEACHERS: HISTORICAL STATISTICS

Introduction

In any given year, the number of teachers active in the workforce is composed of individuals retained from the previous year and individuals entering the system in the current year. The reasons people remain, leave, or enter the teaching workforce are many, influenced, at least, by the age and training of the individual, the availability of jobs, salary level, and quality of the teaching environment. This chapter will analyze and present descriptive statistics of teacher supply. As has been noted, policymakers are uncertain if there will be an adequate number of entrants to maintain the quality of the educational system given the potential for greatly increased demand due to growing enrollments and an aging workforce. The following two sections will present data on attrition and entrance to the teaching workforce that will begin to address this concern.

Attrition

Attrition, or its compliment: retention, is influenced by demographic and economic factors. For the existing teacher labor force, the demographic factors are the aging of the retained workforce, the increase in the age of entrants, and the coming decline in high school graduates that may affect the number of individuals who will train to become teachers. The primary economic factor is salary, or

how the salaries in teaching compare to other professions in which active teachers or teacher candidates with relevant training could enter, in lieu of teaching. A secondary economic factor is the changing preferences for allocating personal income to government, and therefore education, as was witnessed with the occurence of Proposition 2 1/2. Such policies, undoubtedly, can create great systemic attrition apart from that which reflects personal choice. The analysis to be subsequently presented will quantitatively describe the trends in attrition and indicate the implications of such trends for the future.

Aging of the Teacher Workforce

The teacher workforce is aging. The average age of the teacher workforce has increased from age 36 in 1973 to 42 in 1985. The progressive change in the aging of the workforce is illustrated in Figure 74. Table 9 presents age data for the workforce divided into ten 5 year age cohorts. The most dramatic change in total cohort size occurs in for the dwindling of the 20-24 cohort from 9131 in 1973 to 773 in 1985, a 91.5 percent decline. The 25-29 cohort shrank from 18703 in 1973 to 3042 in 1985, an 83.7 percent decline. The greatest increase occurred for the 35-39 cohort from 7123 in 1973 to 15541 in 1985, an 118.2 percent increase. The changes for all the cohorts over the 13 year period is depicted in Figures 75 and 76. Table 10 displays the relative percentages of the age cohorts. The

greatest declines in the relative size of age cohorts are seen, again in the 20-24 age cohort: initially at 12.98 percent and falling, historically, to 1.24 percent; and the 25-29 cohort: 26.59 percent falling to 4.89 percent. The greatest increase is in the 35-39 cohort, growing from 10.13 percent to 24.98 percent over the 13 year interval.

The cause of this change in the age profile of the teaching workforce is due, in part, to the natural aging of the large younger cohorts entering the system 10 to 15 years ago. This natural aging is exacerbated by the average age of entrants to the workforce increasing from 27 in 1973 to 31 in 1985 for those newly hired in the system, and from 35 to 38 for "stopouts" or those having left teaching and subsequently returning. Also, the average age of individuals receiving their first certification has increased from 25 in 1973 to 28 in 1985. The average age of graduates of Massachusetts program leading to certification has remained fairly constant at 26 years of age. Thus, not only is the workforce aging, but many entrants and potential entrants participate in this trend as well. This is, in part, due to the general aging of the state population, increasing from a median age of 29.0 in 1970 to 31.2 in 1980.*44 Table 11 shows the average ages of the active workforce, newly hired, and various categories of attrition. Note that most all of the ages increase in a strictly monotonic manner.

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*44 U.S. Census data, State Data Center, Boston, MISER.

Retention_by_Age_Cohort

Concern about aging arises because the trend is that a large portion of the teaching workforce is progressing to these older cohorts. After a certain point, age greatly increases the probability of attrition of teachers from the system. Table 12 shows the retention for the ten five year age cohorts and Table 13 shows retention rates for ages 22 to 68, by single years of age; both present data from 1973 to 1984. The age cohorts 20-24, 25-29, and 30-34 show relatively high levels of attrition. This is not uncommon to other professions; younger people with fewer responsibilities will, on average, be more mobile than older individuals. The Bureau of Labor Statistics reports that annual turnover rates of 15 to 20 percent in the first few years of work are a normal phenomenon in all occupations[45]. The age cohorts 35-39, 40-44, 45-49, and 50-54 show what might be termed stable levels of retention, from 94 percent to 97 percent of the workforce remaining from the preceeding year. The retention level begins to fall slightly in the 55-59 cohort, and then steeply for the 60-64 and 65+ cohorts as individuals in those groups retire. Over the next ten years the cohorts "44-49" and older will move toward retirement age or retire. This group now comprises 36.6 percent of the active workforce. In 1975 these cohorts comprised only 25.9 percent of the active workforce.

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[45] Op. cit. #19, page 7.

Consequently, it is likely that there will be considerably more people retiring in 1995 than 1985. However, the greatest attrition from retiring will occur after 1995 when the current largest age cohorts begin to reach retirement age.

Trends_in_Retention

A linear regression was estimated for all the age cohorts, using the cohort retention rate as the dependent variable, and a time trend and an indicator variable to account for the obvious effects of Propostion 2 1/2. The results are presented in Table 14. All the coefficients except the time trend for the age group "65+" were significantly different from zero at the 90 percent level of confidence for a two-tailed test *46. The regression showed the effect of Proposition 2 1/2 was to devast the youngest and oldest age cohorts. For the "20-24" year old age cohort, retention rate was reduced by 25.21 percent by Proposition 2 1/2, in addition to the decrease in retention due to the time trend. All the cohorts show a trend toward declining retention. It is hypothesized that the increasing attrition rates across all age groups are caused by the decreasing enrollments and therefore demand, and by changes in the relative wages for teachers. These hypotheses are not support, herein, however, by any empirical testing.

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*46 See Appendix VI for regression statistics.

Age and Certification Categories

The trend in the increase in the average age of the workforce can be observed, as well, for almost all of the certification categories. Table 15 presents the average ages in 1973, 1977, 1981, and 1985 for certificate holders[47]. The categories with the oldest average ages in 1985 are: physics at 42.5, Latin at 43.3, audition/visual special needs at 42.2, school psychologist at 42.5, librarian at 44.2, and supervisor at 43.0. The lowest average ages were found in physical edcuation at 29.6, dance at 30.0, special needs visual at 31.5, and early childhood at 30.5.

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[47] Please note that there are no data indicating what an individual is currently teaching. To facilitate this estimation of age by certification areas, each certification was treated as an individual. The number of certifications exceeds the number of individuals, therefore, since some people with multiple certifications will be counted more than once. A second source of bias in these estimates is that older employees in the system may not appear in the Bureau of Certification and Placement database (BOC) which was instituted in 1972, and subsequently are not included in the average age calculations. Finally, individuals first certified in 1972, for example, may obtain additional certificates in subsequent years. The BOC does not record the date of subsequent certifications, only the first certification. This means that the number of individuals considered to have certificates in earlier years is inflated. Therefore, these numbers have three sources of bias, and must be read as the age of people holding particular certifications, not the age of people, necessarily, currently teaching in those areas.

Attrition_by_Subject_Area

A prevailing hypothesis is that some subject areas, particularly technical disciplines such as mathematics and the sciences, suffer greater attrition than others because the training that is acquired to teach in these subjects is highly marketable. This marketability, it is said, will eventually induce greater percentages of teachers to leave teaching for greater non-teaching rewards. Two sources of data are examined to test whether this popular opinion is true: October Report data on staffing collected by the Massachusetts Department of Education, and the database constructed for this project (see Appendix I)*48. The questions asked are: Historically, what areas show above average attrition and is there any evidence that younger cohorts in the technical areas show higher than average attrition?

What_Areas_of_Teaching_Have_Above_Average_Attrition?

The method used to answer the first question was to calculate the average rate of voluntary resignation for the

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*48 Neither of these databases is ideal. The October Report data provides attrition information about current teaching assignments in specific certifcation areas, but does not include age data. The database constructed for this project provides age and ceritification data, but cannot indicate the current teaching assignment. Further the estimates of attrition, from that database, are plagued with the all the problems that were encountered in providing age by certification estimates, described abcve. Again, the reader is confronted with the warning to interpret these results carefully.

workforce, found in the October Report, and compare it to the voluntary resignation rate for all of the certifcation categories, by creating a rate where the systemwide voluntary resignation rate was used as the denominator and the certification-specific voluntary resignation rate was used as the numerator. A resulting ratio greater than one would indicate higher than average attrition. "Voluntary resignations" was used as a possible indicator for individuals leaving the teaching force to change jobs, as opposed to forced resignation, retirement, or other (which could be maternity leaves, etc., with the stated intent of returning). Table 16, presents the average attrition ratio for the 20 aggregate areas used in this study. The data are sorted from highest to lowest on the attrition rate. These results indicate that technical areas do not, generally, have higher attrition that other areas. Physics is above average and mathematics is about average. However, general science, chemistry, and biology have lower than average attrition. Chemistry and biology have virtually the lowest rates of voluntary attrition. Art studies, the general bilingual category, special edcuation, French, and Spanish are the top five categories of voluntary attrition, preceeding any technical/scientific category.

Do Younger Teachers in Technical Areas Show Higher than Average Attrition?

To answer the question as to whether younger teachers with particular types of certifications, again technical, are more likely to leave the system, certifcation data merged with retirement board data were used. The data are subject to the many problems described in footnote 47. Ten 5 year age cohorts were created, and the number of certifcations in each cohort for each category was tabulated. Attrition by cohort and certification was also tabulated, and rates of attrition by cohort and certification were subsequently estimated. The rates varied drastically from year to year. These results, seriously flawed by the limitations of the data, do not support the hypothesis that younger teachers, in particular subject areas, leave teaching in greater numbers than teachers in other subject areas.

Entrance to the Workforce

The second major component of supply is entrance to the workforce. Entrance to the teaching workforce is constrained by the fact that teachers must be trained. Certification, which is contigent on a personal history of post-secondary education, is a screening device designed to guarantee a minimum level of competence in the teaching workforce. Entrants are thus drawn from the pool of

appropriately trained current or past college graduates. The following section will present some of the quantitative evidence indicating how teacher supply responds to demand, and how trained individuals flow into and out of the teaching workforce.

Expectations_and_the_Demand_for_Teachers

Expectations influence how an individual prepares for entrance into a career. These expectations, about the possbility of gainful employment or salary level, may be formed in a number of ways. As was explained in an earlier chapter, there are, fundamentally, two types of expectations that may be operative in the teacher labor market: myopic expectations and rational expectations. Data supporting the existence of myopic expectations are presented in Figures 77 and 78. Figure 77 shows the relationship between the number of individuals obtaining certification in Massachusetts for the first time, and the number of people hired in the previous period. A linear regression was used to estimate this relationship using the number of first certifications issued by year as the dependent variable and the total individuals hired in the previous year as the dependent variable. The estimation showed that hiring in the previous year explained 94.9 percent of the certification activity *49.

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*49 Statistics on the Regression:
Certs = -94.3 + 1.96 * hired(-1)
        (546.88) (0.14)
 F=185.80   R2=94.89

Figure 78 depicts the relationship of the number hired in the previous year in teaching with the percentage of individuals taking the Scholastic Aptitude Test from Massachusetts indicating their preference to pursue teaching as a career. A linear regression was estimated with the S.A.T. teacher aspirants as the dependent variable and hiring as the independent variable. The estimation showed that hiring explained 88.1 percent of the variation in the aspirations *50. Perhaps, the alarm over the declining number of college entrants expressing an interest in teaching can be ameliorated by the suggestion that students have efficiently processed market signals. Demand was, indeed, low and dropping through the early 1980's.

These results pose the hypothesis that individuals obtain certifications and prepare to enter teaching in close correlation to the state of demand in the teaching system, i.e., that myopic expectations are operative. That they will continue to do so is an optimistic results which suggests a market potentially responsive to the changing demands of education. The problem with this interpretation is that these estimations were made during a period of general decline in total enrollments. There are no time-series of data, for Massachusetts, to observe the responsiveness to greatly increased demand of the type now anticipated. Thus, we are confronted with forecasting

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*50 Statistics on the Regression
Percent SAT Takers Choosing Ed. = 1.57 + .002*hired(-1)
                                  (0.71) (.0002)

  F=74.3   R2=88.10

behavior during a "turning point" in demand: the trend in demand will reverse. This makes one interpret the reliability of the regressions estimated herein with some caution as we contemplate using them for forecasting.

An alternate formulation is rational expectations. No estimations, for this study, have been undertaken to test for the presence of rational expectations in the Massachusetts teaching labor market. This is an important area for subsequent research as it could create very different estimates about the size and responsiveness of the reserve pool. It would also be fruitful to explore how the Proposition 2 1/2 has influenced expectations.

Myopic Expectations and the Systemwide Response by Subject Area

In addition to the general responsiveness of the total of the first time certificate recipients to hiring, the responsiveness of recipients of particular certifications to hiring in analogous certification categories was also investigated. For this analysis, the set of certification categories was reduced to twenty aggregate areas of certification *52. Myopic expectations were assumed. A correlation coefficient 76.0 percent was estimated from correlating the number of first certificate recipients for 1985 and the number hired for the relevent 20 aggregated certification categories derived from October Report data

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*51 See Appendix II for an explanation of how the 20 categories were created.

for 1984 *52. Further, using 1982 to 1986 data for the certifcates earned by graduates of Massachusetts programs leading to certification (MPLC) and October Report data leading by one year, a similar correlation was estimate producing a coefficient of 65.9 percent. These levels of correlation, again, indicate a degree of responsiveness and efficiency on the part of individuals reacting to the demand for teachers generated by public primary and secondary education. This responsivness seems not only to be generic, moving more (or fewer) teachers into education on the whole, but also to be quite specific, targetting even the apporpriate areas of certification.

Pool_pf_Potential_Entrants

As previously discussed, there are a number of sources of supply for the public primary and secondary education workforce. Each source of supply, or "pool" has its own particular characteristics which will be described in the subsequent sections. When the concern is expressed by policymakers whether there will be adequate entrants to fill the potentially large increase in demand in the coming years, an answer can be given only after analyzing the historical behavior of all the pools.

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*52 Only 1 year of data was used because of the updating procedures of the Bureau of Certification and Placement. All years previous to the most current will be biased by certificates received by individuals retraining, changing their skills,etc.

Graduates_of_Massachusetts_Programs_Leading_to_Certification

There are 47 colleges and universities, public and private, in Massachusetts providing programs that lead to teacher certification. Of these 47, there are 11 public and 36 private schools. Appendix I presents the description of a survey of these 47 schools conducted for this study to collect data on graduates of these programs. The survey collected data for the years 1982 to 1986. Additional years were not asked for because of the belief that increasing the amount of data requested would, ultimately, reduce the response rate. The response rates for the total of the 47 schools is show in Table 17 along with:

a) the number that were reported graduated,
b) the number certified before, at, and after the graduation date(1,2,3, and 4 years afterward), and
c) the number hired before, at, and after the graduation date (1, 2, 3, and 4 years afterwards).

Graduates_Hired_Before_Graduation

The high percentage of those hired before graduation indicates that the MPLC programs are frequently utilized for retraining of working teachers. The distribution of the number of years before graduation that these individuals were hired is shown in Table 18, and their ages in Table 19. It would be safe to assume that individuals hired one year before graduation are likely not be retraining, but practice-teaching in a school that has also hired them. Table 20 shows the age distribution of those hired at or

after graduation, and Table 21 presents the average ages of graduates from 1982 to 1986.

Hiring Rates

The low percentage of graduates hired is initially surprising. For the five years of data gathered, 1982 to 1986, the percent not hired for each year, respectively, was 80.6%, 82.1%, 83.0%, 85.2%, and 91.3%. These numbers, of course, are increasing because there are fewer subsequent historical periods in which graduates can be hired for the more recent graduation years. These numbers are more stark, however, when those hired before graduation, presumably enrolled the MPLC's for the purpose of retraining, are accounted for as previous hires; the hiring rates then indicate the number of individuals newly entering the system. When so controlled, and considering that individuals hired 1 or even 2 years before graduation are not retraining, the number show percentages of recent graduates not newly hired to be: 1982=88.5%, 1983=88.1%, 1984=89.2%, 1985=91.2%, 1986=98.7%.

The number of MPLC graduates newly hired by year can also be compared to the total number of newly hired in the system. This is done in Figure 79 (stopouts are excluded). Even in 1985, when data from the survey of public and private programs can show hiring of graduates from the classes of 1982 through 1985, the MPLC graduates seem to contribute little to new hiring.

The question, therefore, which naturally arises is: what then is the source of the newly hired? An initial interpretation of this is that hiring must draw heavily on the past certificate holders who have not yet entered the system, people using the "individual route", or those gaining certification from reciprocity agreements. It should be thoroughly understood as well that past certifcate holders could be, in large part, past MPLC graduates. However, there are not data collected or collectable at this time that could indicate the extent of this.

Public Versus Private School: Graduation, Certification, and Hiring

Table 22 shows the disaggregation of the graduates, certified, and hiring data into the eleven public schools and the aggregate private schools *53. Table 23 displays the relative percentages of public versus private college and university contributions to total graduates, graduates that become certified, and graduates that become hired. For the years 1983 to 1986, public colleges and universities produced more graduates, certifications, and individuals hired in Massachusetts public primary and secondary schools than did private colleges and universities. This graduation, certification, and hiring information for the 11 public colleges and universities that participated in the

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*53 By agreement with the Association of Independent Colleges and Universities in Massachusetts, no disaggregate data on private schools can be presented.

study is ranked in Table 24. Rankings were made only for
1983, 1984, and 1985 because those were the only years with
data for all the public school participants. An example, in
referring to those data, is in 1985 the University of
Massachusetts at Amherst ranked second in graduates, first
in the number certified, and first in the number hired. For
the actual number of graduated, certified, and hired refer
to Table 22.

Graduates_Who_are_Residents_of_Massachusetts

The data on graduates who are residents of
Massachusetts are shown in Table 25. The table shows the
total graduates, the number certified, and the number hired.
In all cases, Massachusetts residents supply at least 50% to
each category of graduates, certified, and hired.

Certifications_Pursued

Elementary certification is, by far, the most popular
certification for MPLC graduates, followed by Early
Childhood. Special Education, Social Studies, Vocational
Studies, or Health Studies usually follows. The lowest
number of certifications are found in Physics, French,
Spanish, and Other Languages. Table 26 shows the
unadjusted data for certifications for the years 1982 to
1986. Note that the low response rate in 1982 undoubtedly
biases the certification distribution.

Demographic_Trends__and_Graduates__of_Massachusetts_Programs Leading_to_Certification

There is a declining trend in high school seniors which translates into a reduction in traditional high school graduates (Figure 80). There is concern that this decline will ultimately reduce traditional age college graduates and, analogously, the number of individuals training to become teachers. If rates of participation in teacher education programs remain constant, then this will likely be the case. However, as Figure 81 shows, the trends in the hiring of graduates age 22 and the number of high school seniors in the Commonwealth 5 years previous are moving in opposite directions. This indicates that demographics, alone, are not the issue, but that economic factors influence hiring behavior. As Figure 77 showed, there is a correlation between the SAT takers professing the desire to enter teaching as a profession and the hiring levels in the teaching system in the previous year. Expectations are a key factor. However, given that a decline in the total number of traditional college graduates is likely, and that there will be an increase in the demand for teachers, teaching will, in effect, have to compete with other professions in trying to recruit students to train. This competition is likely to be driven, primarily, by monetary considerations. Therefore, MPLC's, if they are to serve the Commonwealth in a period of the decline of traditional

college graduates, will need to choose among their options: a) either offer incentives to draw in candidates if teacher salaries do not rise, b) attempt to increase the yield of trained students to hiring, or c) seek to augment enrollments with non-traditional students.

Individuals_Receiving_Teacher_Ceritification

Individuals certified in Massachusetts are comprised of current or past graduates of Massachusetts programs leading to certification, persons obtaining certification under reciprocity arrangements with other states, or people who have taken the route of individual consideration of their credentials and have received certification. The behavior of obtaining a certification is correlated with the demand present in the system, as shown earlier. However, of those who follow the hiring trend by requesting and receiving certification, many have no record of being hired in Massachusetts. Table 27 shows the total number of certifications per year, the number hired before being certified, the number hired in the year of certifcation, the number hired for a range of subsequent years, and, finally, the number who at present are still unhired in Massachusetts as teachers. The number hired in years subsequent to the certification provides an indication of the responsiveness of the reserve pool of certificate recipients not yet hired to new openings. The remaining unhired indicate the size of the pool that is potentially able to be tapped but does not

indicate the responsiveness of these individuals to changing demand conditions, prices, etc. There is no guarantee that the bulk of this pool will be available ever--many may have taken jobs in other professions and some may have migrated out of the State. Those teaching in the private sector in Massachusetts, however, should still be considered part of the pool. Anecdotal information indicates that public school superintendents are well aware of the inventory of potential public school teaching candidates present in private primary and secondary schools.

The Different Certification Routes

It is important to know the source of people receiving certifications. Are they primarily from MPLC, reciprocity, or the individual route? The Bureau of Certification and Placement (BOC) has one year of data, for 1986, which provides information about the source of first certifications. In 1986 for a total of 5605 certifications, i.e., the number of certifications not individuals, the number of certificates from MPLC graduates was 2065 (40.7%); from reciprocity with other states (this may include Massachusetts residents who received certification in a school out of state): 1256 (24.7%); and from the individual route, both in-state out-of-state applicants: 1755 (34.5%) *54. The unfortunate limitations of these data are that we do not know the year of graduation of the

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*54 See Appendix IV for the forms and description of certification.

graduates   of   Massachusetts   programs   leading   to
certification.

Graduates_of_Massachusetts_Programs_Leading_to_Certification and_First_Certification

For graduates of MPLC, the 2065 certificates in 1986
represents the sum of certificate applicants for a number of
graduating years.   The integrated database created for this
study could not track individuals into the the BOC database
beyond 1986.   However, in an attempt to understand the flow
of   MPLC   graduates   into   the   certification   pool,   the
certification activity in 1985 of graduates from 1982 to
1985   was   examined.   The   total   number   of   individuals
receiving approved certificates in 1985 was 3848.   Table 28
shows the   number of MPLC graduates from each of the years,
1982 to   1985, receiving approved certifcations. Note that
there   are   both   adjusted   and   unadjusted   figures.   The
adjusted figure takes into   account the different response
rate of the survey for each of the years for which data on
graduates was   requested and augments   the   actual   data
accordingly.   The unadjusted data show that 29.4 percent of
the individuals certified in 1985 were from 1982 to 1985
graduates of MPLC. The adjusted data indicate that as much
as 34.6 percent of the certifications may have derived from
this group. If 40.7 percent of the individuals certified are
MPLC graduates, then approximately 6 to 11 percent (40.7%
less 29.4% or 40.7% less 34.6%)   of the remaining MPLC

certificate recipient recipients must come from years from the more distant past.

First_Certifications_in_Massachusetts_From_Other_States

For years 1980 to 1982, the BOC collected data on the total number of individuals from Massachusetts and out-of-state obtaining first time certificates. These data are shown in Table 29. Table 30 shows the 1986 BOC data indicating the state from which an individual applied for certification. Note, that some of these individuals may be Massachusetts residents who attended schools in other states.

Types_of_Certifications_of_Initial_Recipients

Figure 82 depicts the certifications for the twenty aggregate certification categories. These are presented only for the year 1985, because the Bureau of Certification does not distinguish between first certification and past certification in their database. Thus, only the current year, 1985, would provide unconfounded data. Table 31 presents the data, indicating that elementary & middle is the most popular category, followed by special education, and early childhood. The lowest number of certifications were in bilingual and physics. Note that bilingual is certainly higher; this estimation was sorted considering English as a second language as the only category for bilingual.

Average_Age_of_First_Certificate_Recipients

The average age of first certificate holders who were hired in the year of certification has, as was noted earlier, increased from age 25 in 1973 to age 28 in 1985. Age data on those certified is only available for those hired; the BOC does not collect age data. The average age of first certifications hired in the year of certification is shown in Table 32. The age of past certificate recipients hired for the first time will be presented in the following section.

Past_Certificate_Holders_Yet_to_Be_Hired

Past certificate holders yet to be hired are individuals who have obtained teacher certification in Massachusetts in some year prior to that during which they were hired, and who have otherwise never been hired previous to their current hiring. This group represents a large percentage of the potential pool of candidates for teachering as well as a large percentage of the total of individuals newly hired each year (Table 33). The rate at which certificate recipients from past years enter the teaching workforce in subsequent years provides an indication of the potential responsivness of the reserve pool. Using the database created for this study, it was possible to track the hiring behavior from the year of certification. Table 34 shows the total individuals

certified in each year and the subsequent years of their
hiring into the system, starting in 1972. Note that for
each year, hiring of past certifications is limited to cases
where the certification was earned in 1972, only one year
after the BOC started to computerize certifications.
Thereby, this study is limited in its earliest tracking of
certificate holders to that year. Further, observe the
number of individuals certified in a particular year, but
hired in a year previous to that first certification. These
individuals, as a special component of the pool, will be
analyzed in a subsequent section.

Estimation of the Certification to Hiring Relationship

A series of statistical estimations provided a general
form to describe the observed certification to hiring
behavior*55. This is shown with a plot of the mean values
of the percent of a certification cohort that is hired
conditioned by number of years after certification in Figure
83. The estimated mean values are presented in Table 35.
These can be used to forecast those potentially available
for hiring in the future, even when demand increases. This
likely produces an appropriate estimate of the lower bound
since we would assume that rates of hiring from past

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*55 The technique used for this used hiring in a particular
period after certification as a function of the total
individuals certified from the relevent leading period,
suppressing the intercept. These regressions were not
pooled. This is a highly restricted model, that might
eventually be augmented to include intercept terms
responsive to changing demand conditions and to pool the
observations.

certificate recipients would increase were demand to increase as is anticipated in the forecast period. Table 36 display the number of individuals available from past first certifcation dates, and the total anticipated to be available for each future year. These numbers must not be interpreted as the total likely to be available from the reserve pool for the given future dates; each future year will add its contribution to the pool, as will other sources in the past and future.

Average Age of Past Certificate Recipients Newly Hired

The average age of past certificate holders who have entered the workforce specific numbers of years from the time of certifcation is show in Table 37. As would be expected the average age increases the longer the time between certifcation and hiring.

Past Teachers in the System Seeking to Return to Teaching

Another large group which contributes to the pool of teachers potentially entering the profession is made up of those individuals who have left the teaching system in some previous year and subsequently return to the system. The event of leaving the system and returning is termed "stopping out". Table 38 displays the total number of those leaving the system for each of the years 1974 to 1984 as well as the total number returning from that year in all subsequent historical years to 1984. The extract of data,

taken for this study from the Massachusetts Teachers Retirement Board database, began in 1971 and therefore tracking reentry prior to 1971 is not possible. Therefore the number for the total individuals "stopping-out" is likely to be biased downward. For the stopout data examined in this report it was observed that some individuals stopped-out twice, some three times, and none were discovered stopping-out greater than three times. The average duration of a stopout is two years, the median stopout is one year. Over 84 percent of the individuals who have stopped-out and return do so within 3 years.

Estimation of the Attrition and Re-entry Relationship

A general relationship was estimated from these data. Figure 84 shows the form of the relationship, indicating the percent returning per year as a function of time. The estimated points in the curve are show in Table 39 *57. From this relationship the number of individuals returning in the future from the pool of individuals formed by past attrition can be estimated. These estimates are shown in Table 40. Again, these represent only a part of the reserve pool, and does not integerate the stopping-out behavior that can be expected from future years.

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*55 See Appendix VI for the regression statistics.

Returning_Stopouts_as_a_Percentage_of_Entrants

The national figure for the percent of entrants who are past teachers returning to the workforce is 51 percent for the year 1985-86. Table 41 shows these percentages for Massachusetts teachers since 1974. Note that the earlier years are biased downward due to data limitations and that the highest year, 63 percent, occurred after Proposition 2 1/2.

Age_Distribution_and_Average_Age_of_Stopouts

The age distribution of individuals stopping-out by year is shown in Table 42, and the average ages are shown in Table 43. The average age of stopouts has been increasing over time. It is hypothesized that this trend may, in part, be due to women bearing children at a later age. This hypothesis was not tested in this study.

Non-Certified

The last source of supply of teachers comes from those who are not certified, but teaching. In this study these individuals are defined by persons in the MTRB database, but not registered as certified in the BOC database. These will include, however, employees certified previous to 1971 and obtaining no further ceritifications, or individuals in the workforce not requiring ceritifications by the Bureau of Certification and Placement. Individuals in occupational education are a primary contributor, as well as those hired

on waivers and in the system for a sufficent amount of time
to be recorded in the Massachusetts Retirement Board
database. Table 44 shows the number in the active workforce
registered as certified and those not registered as
certified. As one can see, the percentage of the workforce
labeled as not certified diminshes over time. This is an
indicator of the extent to which the pre-1971 certifications
influence the data.

Waivers: Hired Without Certification and Then Subsequently Certified

Individuals hired without certification, on waivers or
otherwise, and may subsequently become certified. Table 45
shows the total number hired per year, the number certified
in the year of hiring, the number certifed before hiring,
after hiring, and those never (or yet to be) certified. A
linear regression was estimated with the percent certified
after hiring as the dependent varaible, and a time trend,
and an indicator for Proposition 2 1/2 as independent
variables. The results, though not significantly different
than zero, showed that approximately 7.2 percent of all
those hired will be hired without certifcation, and will
subsequently obtain certification *56.

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*56 Subsequent Cert.= 0.072 - 0.001*TIME + 0.588*Prop 2 1/2
                      (.009)   (.001)   (0.016)
                  F = 6.46   R2 = 56.0

Waivers Granted by Certification Area

Table 46 show the certification areas for which waivers were applied for in 1986 and 1987, computed from data of the Bureau of Certification and Placement. This provides some indication of where shortages are occurring, in that requests to hire individuals on waiver are made generally in the face of conditions in which schools could not otherwise find individuals with certifications to hire. For non-bilingual teachers the areas of greatest demand are math, English as a second language, Spanish, reading, and guidance counselors. For bilingual teachers, elementary, early childhood, social studies, and general science had the highest number of waivers. Note that these data do not include information on special education teachers.

Hired With No Record of Certification

A linear regression was estimated with the percent not-certified as the dependent variable and a time trend, an inidcator variable for Proposition 2 1/2, and an indicator variable for the first three years of the data to account for administrative lag in making the certification computer system operational. The results, again not significantly different from zero, indicated that 21.8 percent of all newly hired do not have certifications and will not,

subsequently, obtain certification *57. These individuals are likely to be largely concentrated, however, as occupational education employees and other staff, not required to be certified by the Bureau of Certification and Placement. These people cannot be accurately accounted for by the database created for this project.

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*57 No Cert. = 0.218 + 0.001*TIME - 0.147*Prop 2 1/2
              (0.048) (0.006)   (0.058)
              F = 3.25   R2 = 48.2

Chapter VI: FORECASTING TEACHER SUPPLY AND DEMAND

Introduction

Forecasting teacher supply and demand requires the integration of all the data reviewed in this study. Trends in enrollment, retention, certification, the creation of the reserve pool, the impacts of course taking behavior and of teacher workloads, and the balancing effect of the student to teacher ratio must be considered simultaneously. This section provides a forecast for the teacher supply and demand system taking these issues into account. Two forecasts, one an aggregate and the other disaggregate by certification area, will be presented. The aggregate systemwide forecast is presented to acquaint the reader with fundamental activity in the whole educational system. From this, a number of simulations will be conducted to show how the various components of the system interact. After exploring this simple model, the disaggregated model, or the model which forecasts the demand and supply for each of the 20 categories of teaching and administration, will be presented *58. This section will close with a summary of the trends observed in the forecasts.

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*58 See Appendix II.

Systemwide_Forecast

The systemwide model is designed to produce statistics on the general activity of retention, hiring, enrollments, age of the workforce, and the reserve pool.

The assumptions used to create this model are:

a) the retention rates for each, of the age groups of teachers by single year of age remains the same as in 1985;

b) the age distribution of the entrants to the sytem will remain the same as it was in 1985;

c) the reserve pool is created from the relationships estimated for past certifications and attrition presented earlier; and

d) the student to teacher ratio can be meaningfully computed for the state as a whole as the ratio of total enrollment to total employed ratio and that its baseline rate can be set at 13.63, the rate for 1985.

Thus, simulations are conducted using the condition of the system in 1985 as an index.

Simulation_#1:_The_Aging_of_the_Workforce

This simulation holds student enrollments per year and teaching entrants in each of the forecast years constant, at the 1985 level, to allow observation of the increase in the student to teacher ratio due solely to the aging of the workforce. The results are shown in Table 47 and reflect an interesting fact that under these conditions, an aging workforce, ceteris paribus, degrades the system's student to teacher ratio. From the 1985 level of 13.63 this ratio rises through 1995 reaching 13.72. Aging, alone, in this simulation sets annual new teaching entrants (with given age

distribution, as currently prevails) somewhat arbitrarily at 3966 per year. This is the number of entrants actually hired for the first time into teaching in 1985. Against this, the simulation shows that the aging accounts for a loss of 283 individuals from the workforce within ten years, reducing the net impact of additions to the system because of higher attrition of older age teachers. The average age of the workforce in this simulation increases from 42.35 in 1986 to 44.99 in 1995. These changes are seemingly trivial, however, what is assumed is that the pool of new entrants can replenish the ranks of those leaving. If the reserve pool is shallow, the effect of aging will be more noticeable. A simulation was estimated where no entrants entered the system over the forecast period. The workforce age in 1995 was 50 years old, and the workforce had diminished by 23,800 teachers. A one percent reduction in attrition in each of the ten forecast years would produce roughly 2380 additional teachers which is equivalent to one year of hiring. This again points out the importance of retention in the supply of teachers.

Simulation #2: Changes in the Student to Teacher Ratio

These simulations explore how changes in the student to teacher ratio influences supply and demand. The first holds the ratio at its 1985 level, allowing both student enrollments and teaching entrants to vary. Table 48 shows the results of this simulation. Holding the student to

teacher ratio of the system constant reduces the number of
teaching entrants needed for the years 1986 to 1990 from the
index year 1985 which hired 3966 individuals. But
subsequent to those years the need for entrants soars at the
compound annual rate approaching 10 percent through 1995 as
the aging of the workforce coincides with increasing
enrollments. The reserve pool for the total workforce is
expected to keep pace because it is assumed to be based on
myopic expectations which are positively correlated to
hiring in the previous period. The smallest margin of
surplus in the reserve pool over hiring (877 people) occurs
in the period 1992, when the increase in total enrollments
begin to accelerate.

Allowing the student to teacher ratio of the system to
degrade a single point over the 10 year period produces the
results shown in Table 49. The decrease in the number of
total teachers employed, in 1995, relative to those needed
to meet the 1985 student to teacher ratio is 4384. If the
average salary for teachers in Massachusetts is $26,800 as
reported by the American Federation of Teachers *59, then a
saving of $117,490,000 would be saved in 1995 alone by
allowing the system to degrade (the salary held constant
over the period for the sake of illustration).

Increasing the student to teacher ratio by of the
system by one point over the course of the 10 year forecast

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*59 Page 7, "Survey & Analysis of Salary Trends 1986",
F.howar Nelson, Jewell C. Gould, Julie Silverwood, Reserach
Dperatment of the American Federation of Teachers.

period produces the results show in Table 50. The total number of additional teachers needed in 1995, as compared to keeping the system at the 1985 quality level is 5080. With an average salary of $26,800, this would cost the Commonwealth an additional $136,140,000. Again the reserve pool is of adequate size to support this decrease in the student to teacher ratio becasue of the assumption of myopic expectations.

Simulation #3: Responsiveness of the Reserve Pool

The first four simulations have indicated that the historically observed responsiveness of new certification activity to hiring in the previous year and the flow of those who have stopped out of the system back into the system, make the reserve pool move with changing needs. None of these simulations show shortages. It must be emphasized, however, that because this model is not disaggregated by either subject area or geography, surpluses do not necessarily indicate an adequate supply of teachers for all subjects or communities. As the chapter on demand indicated, there is considerable diversity in levels of enrollment and enrollment changes in the system. The replenishing of the reserve pool over time is primarily conditioned by the responsiveness of individuals to become certified in a particular year given the demand signals present in the level of hiring in the system in the previous periods. Recall, however, that the estimation of this relationship, reported herein, was made with data collected

during a time of total enrollment decline. It is uncertain whether the estimated level of responsiveness will persist through the coming turning point in demand. The previous systemwide simulations in this section, have shown that the reserve pool will be adequate if current responsiveness is maintained. What can be expected, however, if responsiveness to hiring is low? A simulation of potential low responsiveness was conducted employing the lower limit of the 95% confidence interval around the regression coefficient that was estimated in regressing certifications on hiring in the previous period. This gives a reasonable test of what would happen to the system in a worst case scenario of low responsiveness. The worst case shows that shortages arise.

The results of the worst case scenario beg the question of why resposiveness might be low. The answer cannot be show at this time in the MISER model, because changing responsiveness, in this model, will result from shifts in basic supply and demand relationships conditioned by an upturn in demand. Beyond the current model, an interpretation would have to be couched in terms of the wage elasticities of the supply of teachers in the context of competition in the labor market for people with training similar to that of people oriented to teaching. Given the expected decline in traditional college graduates, the teaching profession will have to compete more vigorously with other professions to bring students into the teaching

profession. The increase in demand for teachers born of increasing primary and secondary grade enrollments, and a potential general labor shortage due to the decline the high school age cohort, will make success in this competition difficult if expected teacher salaries are not at least equivalent to those of the relevent competing professions. Low responsiveness may derive from such a lack of wage competitiveness, though the exact relationship between wages and the responsivenss of supply has not yet been explored empirically for the Commonwealth.

This concludes the simulations conducted at the systemwide level. The discussion of the effect of the trend of future teacher supply and demand now turns to examining the supply and demand conditions for individual subject areas.

Supply_and_Demand_by_Specific_Subject_Areas

The second model considers ages by subject retention, student enrollments by subject areas, and the effects of subject specific student to teacher ratios. The methodology developed to make these forecasts assumes:

a) retention by subject is based on historical October Report data;

b) October Report retention rates are disaggregated by age based on the age distribution of the entire workforce conditioned by the October Report subject specific retention, and smoothed to produce the historical retention rates observed in those data;

c) the total workforce is disaggregated, in the historical period based on the workforce distribution by subject in the October Report;

d) total enrollments by subject area were produced from information about course-taking gathered by the Department of Education *60 and discussions with superintendents, teachers, and students;

e) the student to teacher ratios were derived by relating the simulated historical enrollments by subject to the number report in the October Report as teaching in the area in the appropriate year;

f) estimates of class size were made from discussions with teachers and the reasonableness of such estimates given the calculated student to teacher ratio;

g) the curriculum chosen was held constant over the forecast period;

h) the student to teacher ratio was held constant except when demand was greater than the reserve pool (then it was increased for that period only) or when supply was excessive (the ratio was the decreased for that period);

i) if supply was excessive, the number of teachers was not reduced, rather there was simply no new hiring for that period;

j) transfer activity among subject areas, which is available in the October Report, was not considered in the forecast period, but was considered a source of new entrants in the historical period thereby conditioning retention on the basis of retained in the subject area, not the system as a whole.

The twenty categories *61 created by aggregating all

the certification categories were chosen to make the

estimation of the forecast tractable for microcomputers. The

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*60 Op. cit.; "Course Taking Among Massachusetts High School Students".
*61 See Appendix II.

results from the forecast are presented in Tables 51 to 70, and depicted in Figures 85 to 104. The presence of "negatives" in the forecast indicates an oversupply of teachers. That is, given the level of student enrollments, teacher retention, and the student to teacher ratio, there are more teachers than required to maintain the student to teacher ratio at the 1985 level. In these cases, there is no hiring.

The most interesting results are seen for the subject areas traditionally assigned in secondary grades. These subjects exhibit excess suply for a number of years, then overwhelming demand. The shift is caused by the filtering of large cohorts into the secondary grades in the beginning of the 1990's. The juxtaposition of first excess supply and then excess demand presents a curious problem. Assuming that certifcation behavior is conditioned by myopic expectations, rational individuals observing market signals from the previous period will not prepare for certification in secondary subject areas. The 4 to 5 year period of decline in teacher hiring will cause many individuals in college forgo training due to these market signals. The potential problem that must be faced is that the increase in demand for secondary school teachers will be sudden. In a matter of a year, for many subjects, hiring needs double and triple. The reserve pool becomes inadequate because of the low number of certifications obtained in the periods of extremely low demand. Within two to three years after the

upturn in secondary enrollments, the system could be facing a temporary shortage due to the lagged effects of low past demand which reduced the number of individuals becoming certified. Supply and demand will eventually equilibrate as the demand is recognized, and individuals can prepare for entry into the teaching force. It is the period from 1991 to 1995, however, that may present problems and therefore is the greatest challenge to policymakers.

Potential shortages may occur, after 1991 in English, mathematics, general science, social studies, French, and vocational studies. Bilingual is presently experiencing an undersupply of teachers (this will be examined more closely in Part II). Numerous other areas such as special education, biology, physics, chemistry, and other languages have very small surpluses indicating that there will likely be schools experiencing difficulties in hiring for those subjects.

Again, an appropriate caution is that these results derive from a model which creates a reserve pool over time based on the lagged response to hiring in the system. The inventory of potential entrants becomes depleted when the system is in a period of low demand; pessimistic expectations are likely to drive individuals to other professions. As the information about increased hiring filters into the labor market, individuals will respond. The problem with the anticipated trends that will confront the Commonwealth in the coming years is that sudden sustained demand in secondary grades will be coupled with a

preceeding period of prolonged decline. The challenge for policymakers is to cultivate rational expectations: _expectations based on forecasts rather than past hiring activity_, by making the labor market and college students aware of the character of demand in the coming years. Without promulgating this information rational expectations are less likely, and the effects of myopic expectations, i.e., teacher shortages, more probable.

Part II: ANALYSIS OF MINORITY ENROLLMENTS AND STAFFING

Introduction

This section will present an analysis of a number of aspects of the education of minority students in the Commonwealth. Historical minority enrollments will be analyzed noting changes in the various minority groups. The relationship of minority teacher to minority enrollments, as measured by the student to teacher ratio, will be examined for a subset of Massachusetts communities. The production of minority teachers from the Massachusetts programs leading to certification will then be investigated to provide information about whether the current minority staffing shortage will be reduced given current trends in graduates. Finally, an analysis of bilingual teachers will be undertaken reporting on the number of individuals certified by area, in the system over the years.

Minority Enrollments: Data Sources

For each year from 1979 until 1985 individual public school reports and individual private school reports were extracted from the Massachusetts Department of Education October Report data tapes. In a second step, only the data for enrollment by race was retained. Counts of pupils by

race and by grade were available. Six categories of race were used: American Indian, Black (not of Hispanic origin), Asian, Hispanic Non-White), Hispanic White, and White (not of Hispanic origin). The grade categories include: Pre-- Kindergarten, Kindergarten, Ungraded, Grade 1 through Grade 12, Grade 13 and Postgraduates, and Grade 14. In an effort to make data analysis tractable, the total counts by race were considered at the school system level (i.e., individual schools in a system were aggregated).

Statewide Trends in Minority Enrollments

For public schools at the state level, the October Report data exhibits a sharp decline for total enrollments from 925,000 pupils in 1979 to 739,000 pupils in 1985. This represents a drop of approximately 20 percent. This decline is mainly attributable to the decline in White enrollments (-23.7%). Total minority enrollment, on the contrary, increased 7.4 percent from a total of 108,964 in 1979 to a total of 117,089 in 1985. However, all minority groups did not follow this trend. A remarkable fact is the doubling of the enrollment of Asian students. Also worth noticing is that the percentage participation for each minority group account for less than 5 percent of the total enrollment except for Blacks who account for 7.55 percent.

Race	Percentage Change in Enrollments 79-85
White	- 24.1
Black	- 5.7
Asian	+ 98.2
Hispanic Non-W	+ 44.6
Hispanic White	- 0.9
White	- 23.7

Graphic representations of the above table are show in Figures 105 and 106. Enrollments in private schools has increased 39 percent between 1979 and 1983, and then declined 2.9 percent from 1983 to 1985. No definite trend emerges from the data reported in Table 72. Caution should be exercised when trying to derive any conclusion from the data. Indeed the school reports were not consistent throughout the years; often time-series were incomplete and therefore the computed totals are not based on the same number of school systems every year. This lack of consistency precludes further analysis.

Community_Trends_in_Minority_Enrollments

To make the analysis tractable, school system time-series were selected for communities with minority enrollments greater than 10 percent. This produced a sample of the 32 school systems listed below:

1.	Amherst	17.	Lowell
2.	Ayer	18.	Lynn
3.	Boston	19.	Mashpee
4.	Brockton	20.	New Bedford
5.	Brookline	21.	Newton
6.	Cambridge	22.	Oak Bluffs
7.	Chelsea	23.	Salem
8.	Clinton	24.	Shirley
9.	Concord	25.	Southbridge
10.	Fitchburg	26.	Springfield
11.	Framingham	27.	Sunderland
12.	Holyoke	28.	Waltham
13.	Lawrence	29.	Wareham
14.	Leominster	30.	Wayland
15.	Lexington	31.	Weston
16.	Linclon	32.	Worcester

These communities are show in Figure 107. Extensive enrollment data by racial and ethnic categories are presented in Tables 73 to Table 87. The change in the percentage of minority students for these communities is presented in Table 88 and depicted in Figure 108.

Minority Staffing

The data for minority staffing in primary and secondary schools was collected from the Equal Employment Oppurtunity form 5 (EEO-5). This form provides information about staffing by race for a number of categories. Data on both the current staff and those newly hired is available. The form is presented in Appendix V. The EEO-5 is not a census, but a sample. The data are collected for the Federal government. For the 32 communities with minority enrollments greater than 10 percent, only a subset also had data submitted on the EEO-5 forms for the years 1982 to 1985 in the collection of the EEO-5 data. These aggregate

staff data, for both current staff and those newly hired, are presented for the selected towns in Table 89. Data for 1982 were available for 16 of the 32 towns, for 1984 in 17 of 32, for 1985 in 2 of 32, and for 1986 in 14 of 32. Tables 90 to 101 present the data disaggregated by white and minority groups, and reported here because it is unavailable anywhere else.

Minority_Student_to_Minority_Teacher_Ratios

These data alone, do not well inform the reader about the relationship between the number of minority students and the number of minority teachers. Implicit in the concern for the relationship of the number of minority students relative to the number of minority teachers is the belief that achievement by minority students will improve with exposure to an adequate number of minority teachers. This hypothesis was not tested in this study. Figures 109 to 110 show the ratios mapped for the years 1982 and Tables 102 to 103 show the student to teacher ratio for minority enrollments to minority teaching staff, and white enrollments to white teaching staff. In all cases the minority ratios exceed the white ratios, sometimes by magnitudes of twenty.

Minority_Graduates_of_Massachusetts_Programs_Leading_to Certification

Data for this analysis was obtained from the survey conducted by MISER for this study. Table 104 shows the

total graduates of MPLC and the number reported as minority graduates. It must be noted that 19 schools of the 41 that responded did not provide information on race. These results indicate that minorities as a percentage of total MPLC graduates are falling. Further, the percent of minorities hired is not analogous to the percent graduated. It is hypothesized that this is caused by either bias in the system as it hires minorities, or that minority graduates choose other professions than teaching.

This trend in the number of minorities graduated and hired indicates that without some kind of policy intervention, the student to teacher ratios reported above will at best remain the same in the short-run, and may increase in the long-run.

Bilingual Teachers

The bilingual student minority comprised approximately 64,960 individuals in 1985, this represents aproximately 7.7 percent of the total public school enrollments *62. Given the increasing trend in minority enrollments reported in the previous section, this relative percentage will grow, creating increased demand for bilingual teachers.

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*62 page 13, "Seeking Educational Equity for Linguistic Minority Students," May 1986, Massachusetts Department of Edcuation, Bureau of Equal Educational Opportunity.

Bilingual Certifications by Category

Bilingual education is needed in all categories of teaching. Table 105 shows the current inventory of bilingual certifications. Table 105 also shows the average age of these certificate holders and the number of active teachers with bilingual certification in that field as presented in the October Report for 1985. These results seem to indicate that there are many more bilingual teachers eligible to teach than are actively teaching. This suggests that there may be adequate numbers of teachers, but they are not in the appropriate school systems, or are not being deployed to meet shortages.

Bilingual Teachers and Waivers of Certification

In Table 46 displayed earlier in the report shows the reported waivers for bilngual subjects were highest for elementary, early childhood, math, social studies, and general science. Note that waivers for special education is not included in those data.

Part III: RECOMMENDATIONS FOR DATA COLLECTION

In order to provide reliable data for planning, the need for an integrated database, maintained to produce data for mathematical forecasting models is needed. The current state of affairs is such that data items necessary to answer key policy questions are not available. It it critical that a database be created and maintained to track individuals through the system. Only at that level of disaggregation can the numerous questions about the teaching force be answered. The database assembled by MISER with the help of the Massachusetts Teachers Retirement Board, the Bureau of Certification and Placement, and the colleges and universities that responded to the survey, is the most comprehensive database addressing teacher supply in existence to date. However, those data have many demographic charactersitics missing for most of the individuals in the database. Below is a list of those items which are not available for active teachers in the Commonwealth:

1. No data on race.

2. No data on sex.

3. No data current assignment.

4. No data on class size.

5. No data on academic background.

6. No data on out of state experience if applicable.

7. No data on the most recent certification obtained
   if multiple certifications are the case.

These are   fundamental data   that   could   provide
information on:

- attrition by age, subject taught, sex, and race.

- retention by age, subject taught, sex, and race.

- retraining by certification, age, sex, race.

- years in service by age, subject taught, sex, & race.

- stopout behavior by age, subject taught, sex, & race.

- sources of teachers by college, state, and

   certification area.

- migration of teachers into Massachusetts by age,

   subject taught, sex, and race.

- class sizes by subject taught.

- course taking behavior.

- minority staffing.

These are basic questions that cannot be answered by
the existing data.   The problem that must be confronted is
to determine the best way to collect these data. One
alternative would   be to start a new system of data
collection beginning with entrants to the system.   The

existing sites eligible for this data collection are the Bureau of Certification and Placement, and the Massachusetts Teachers Retirement Board. Age, sex, race, and academic background data could be collected at the Bureau of Certification and Placement. These data, newly added to that database, would only pertain to those becoming first certified or those becoming recertified. This plan of building on new entrants would leave the characterstics of the majority of the stock of teachers in the active workforce still absent. This, of course, would severely limit the usefulness of the data.

The various reports collected by the Department of Education provide numerous aggregate data on the entire active workforce, but, again, not the individual records needed to build detailed planning models. The Massachusetts Teachers Retirement Board could improve its data collection by reviewing the membership form that all participants must complete. The category for "sex" could be made reliable, and additional demographic information could, potentially, be included. Again, however, if pertained only to new applicants, data would be lacking on the majority of active teachers for many demographic attributes.

The above mentioned data collection sites would not be able to provide information on course taking behavior, class size, or current teaching assignments. Nor would they provide information on the number of graduates from Massachusetss programs leading to certification. Without

these data we would not know the courses being being taught, the demand for teachers in particular subjects, and the student to teacher ratio. Further, without information on MPLC graduates the efficiency of those programs, in terms of yielding teachers to the Commonwealth, would be unknown.

The most comprehensive and reliable data would be obtained by a teacher census administered on a yearly basis as well as reporting of graduates of programs leading to certification from all the post-secondary schools offering such programs. The teacher census would, in one year, account for the demographic characteristics of the entire stock of teachers, and in 5 years provide enough data, in terms of a time-series, to provide fairly reliable estimates for the system. The best, and likely the least expensive, method of obtaining these data would be by using computer optical scanning (opscan) forms designed to collect the survey responses of teachers. The tabulation of the forms could be accomplished by obtaining optical scanning hardware, or contracting for data-processing. Descriptive statistics could be quickly generated by a program that would input opscan data. A forecasting model could be linked into the system thereby creating the capacity to produce immediately updated teacher supply and demand forecasts. Data from the MPLC's could be collected on opscan forms, or downloaded directly from campus computers when possible.

There are certainly other methods, but this approach would be comprehensive, labor, rather than capital,

intensive, and could be implemented very quickly. The idea of a "forms day" may not be necessary; the form could, if well designed, be quite brief. Data from the MPLC's could be returned to each school, providing them with information about how many of their graduates have currently become certified and have entered teaching in public schools in the Commonwealth. The benefits of this data collection approach have already been exploited by California and New York, states much larger geographically and in terms of populace (see Appendix VII). A pilot study of responsiveness to such a method, and to the appropriateness of the form design, could be conducted to explore the potential problems and costs of this approach. Again the value is that within a year these data could be available. Given the coming difficulties due to the impending demographic trends, the value of quickly collecting this information now must be weighed against alternate plans that may provide information in the more distant future.

Appendix I:The Integrated Database

The data employed in this study came from numerous existing sources and a survey conducted specifically for this project. Three data sources were of primary importance in providing data to analyze the supply of teachers. They are the data collected from the Survey of Colleges and Universities (henceforth to be referred to as the Survey), The Bureau of Teacher Preparation, Certification and Placement (the BOC), and the Massachusetts Teachers' Retirement Board (the MTRB). The basic recording unit for these data were records with information pertaining to individuals. One product of this study is an integrated database which contains a record for each individual who is present in any of these three data sources.

The Survey of Colleges and Universities Database

A survey to all Massachusetts' public and private colleges and universities which have programs leading to teacher certification. Of the forty-seven institutions which were sent the survey, forty-one elected to participate in the project. (See Table I.1 for the listing of those institutions which participated and the data which they contributed, and Exhibits I.1 and I.2 for the survey instruments.)

The survey asked for information on individual students graduating in the years 1982 through 1986. The survey also

solicited information on individual students who were enrolled in the academic year 1986-87. The data items collected for the above mentioned populations are:

1. Social Security Number,

2. Date of Birth,

3. State of Residence at Time of Initial Enrollment,

4. Certificate Pursued or Major,

5. Year of Graduation for Graduates or Class Level for Current Undergraduates,

6. Year of First Entrance to College,

7. Status on Entry (i.e., Transfer/Non-Transfer Student, Graduate Student, Non-Degree Student)

8. Minority Status,

9. Sex, and

10. College/University of Attendance.

These data provide a general profile of the group of persons who are currently preparing for a teaching career or who prepared for a teaching career in the recent past in Massachusetts' colleges and universities and graduated.
The reponse rate was not 100 percent, as shown in Table I.1. For many of these institutions, the task of gathering this data and then providing it in the requested format was reported to be an enormously time-consuming task.

The data collected allow us to report, for the teacher candidate pool, the demographic characteristics which are called for in this Teacher Supply and Demand Study.

Recommendations will be made as to alternative ways these data could be collected and maintained in the future.

The Bureau of Teacher Preparation, Certification, and Placement Database

The Bureau of Teacher Preparation, Certification, and Placement has a computerized database which was implemented in 1981. As of August 1986 this database contained 173,500 records of persons who have received and/or applied for teacher certification in the state of Massachusetts. It contains 100% of the records of persons who received certificates or applied for certification from the year 1981 to the present day. It also contains 100% of the records of persons who received certificates from 1971 to 1981. Finally, the database contains approximately 20% to 30% of the records of persons who received certificates from 1956 to 1971.

It should be noted that some vocational studies teachers are not required to obtain certification from this Bureau. It is estimated that persons make up approximately 20 to 30 percent of the teaching force. The data items collected, collected for each individual, from this database for this study are the following:

1. Social Security Number,

2. Last Name, First Name, and Middle Initial,

3. Certificate Number,

4. The Date on which a Person's First Certificate

was Issued,

5. The Field(s) and Level(s) in which Certification
was Issued, and

6. The 'Approval' or 'Pending' Code for Each Field
of Certification for which a Person Applied.

The resulting data file contains the numbers of certifications by academic field and associated grade levels for each person. Unfortunately, the date on which a certificate was issued (data item 4) is the date on which a person received a first certification. It would have been useful to know the dates on which a person received subsequent certifications so as to allow the derivation of trends concerning teachers' perceptions of professional opportunities and staffing needs.

A valuable source of data which the BOC collects but does not fully utilize is data supplied on a person's college transcript. In applying for Teacher Certification in Massachusetts, a person must supply a copy of an official transcript. As of 1986 the BOC is recording the state of an applicant's alma mater. This can be used to estimate the potential supply of teachers from in-state and out-of-state colleges and universities. The BOC is considering maintaining, for persons who attended in-state institutions, a code to indicate the institution of higher education from which they graduated.

However, it is possible to collect more information from college transcripts. Many of the transcripts we have

inspected record date of birth, year of entrance into college, major and/or the degree awarded, the state of residence at time of initial enrollment, and the date of graduation. Some college transcripts also record a person's sex. These are all data items which were collected in the Survey and which, in the future, could be collected and maintained at the BOC.

The Massachusetts Teachers Retirement Board Database

The MTRB Database that was utilized in this study is one maintained primarily for financial accounting purposes. In general, membership in the Teachers' Retirement System is required for all persons defined as teachers, with certain exceptions (See the Teachers' Retirement Board Membership Blank - Exhibit I.3).

This particular MTRB database was operationalized on computer in 1984. Posting of monthly payments in the copy of the MTRB database utilized in this study is complete through February 1986. Included are the records for anyone who has an active/inactive account as of the year 1972. Inactive accounts are those in which there are no current incoming payments but which have not been legally terminated.

The data items which were extracted from the MTRB database for each person's record are the following:

1. Social Security Number,

2. The MTRB Identification Number,

3.   The Last Name, First Name, and the Middle Initial,

4.   The Contribution Rate,

5.   Sex,

6.   Date of Birth,

7.   Initial Date of Membership,

8.   The Last Activity Date,

9.   The Last Contribution Date,

10. The Last Agency Contributing to an Account,

11. A Member's Monthly Contribution Schedule, and

12. Information on Refund, Buyback, and Retirement
     Transactions.

As stated above, this particular database is utilized mainly for accounting purposes. Though the structure of the database does allow space for recording information such as sex and date of birth, the contents of these data fields have not been accurately maintained. This is unfortunate in that this information is significant in analyzing teacher supply and demand. Further, the fields which contain data on contribution rate, initial date of membership, and last activity date are not consistently maintained.

Given the above caveats, the data extracted from the MTRB database details a person's work history. It was assumed that the date at which a person entered the MTRB system indicates the date a person began employment in the state's public primary and secondary education system. This is not always the case - in particular, in the cases of

part-time, substitute, and temporary teachers. From the extracted data a person's length of stay in the profession, periods of leave from the system, reentries, and dates of termination have been derived.

Information in the MTRB database which in the future would be of significance to analyze for its import in examining teacher supply factors is that of salary and school district data. From the MTRB database it is possible to establish the school system(s) in which a person is and has been employed. Further, salary level information is available for each individual on a year to year basis.

Integration of the Databases

The data from these three sources has been merged to produce an integrated database in which the basic recording unit is that of the individual. The value in creating such a database is that it affords the opportunity to do many kinds of analyses. The types of correlations which can be established are not limited by the structure of the database. Rather, limitations are a result of the types of data contained in the database and the accuracy with which the contents of the database are maintained.

The integrated database has allowed the derivation of numerous historical rates and descriptive statistics. In general, the database provides the following types of information for each individual:

1. Personal Information,

2.   Educational Background,

3.   Certification History, and

4.   Employment History.

(See Table I.2 for more detail).

The greatest detail on individuals in this integrated database is for those present in the survey. For these persons the full complement of demographic characteristics called for in this study. It is possible to report how many of those who prepared for a teaching career actually sought and received certification in the state and then went on to join the teaching force in Massachusetts. In other words, it is possible to track their progression through the state's educational system. It is possible to obtain an idea of the time period which elaspes between the date a student graduates from college and seeks certification and the time which elapses between the date of certification and the person's entry into the teaching profession.

For an individual present in the BOC and/or MTRB but not in the Survey, information is lacking not only on educational background, but also accurate information on sex and age. Further, from these two data sources, no information concerning a person's minority status can be obtained.

TABLE I.1

TEACHER SUPPLY/DEMAND SURVEY DATA BASE

CODE	SCHOOL NAME	ABREV.	RECS #	SURVEY STATUS			SURVEY DATA YEARS						GRAD LEVEL PROG	COMMENTS
				IN	NOT IN	NOT IN PARTIC	GRADS 82	GRADS 83	GRADS 84	GRADS 85	GRADS 86	CURRENT ENROLLMENT 86-87		
01	AMERICAN INTERNAT.	AIC	131	X				X	X	X	X	X (SEN,JUN,SOPH)	X	NO GRAD LEVEL STUDENTS IN 86-87
02	ANNA MARIA COLLEGE	ANAMARIA	77	X				X	X	X	X	X (SEN,JUN,SOPH)	X	ONLY A FEW SENIORS
03	ASSUMPTION COLLEGE	ASSCOL	76	X			X	X	X	X	X			
04	ATLANTIC UNION COLL.	AUC	84	X			X	X	X	X	X			
05	BERKLEE COLLEGE	BERKLEE	166	X			X	X	X	X	X	X (SEN,JUN,SOPH,FRESH)		
06	BERKSH. CHRIST. COLL.	BECHRIST	27	X				X	X	X	X	X (SEN,JUN)		ONLY PARTIAL FRESHMEN CLASS
07	BOSTON COLLEGE	BOSTCOLL	807	X			X	X	X	X	X	X (SEN,JUN,SOPH)		
08	BOSTON CONS. MUSIC	BOSCONMU	43	X			X	X	X	X	X	X (SEN,JUN,SOPH)	X	GRAD LEVEL STUDENTS MAINLY 86-87
09	BOSTON UNIVERSITY	BOSTU	3859	X			X	X	X	X	X			
10	BRANDEIS UNIVERSITY	BRANDEIS	58	X				X	X	X	X	X (SEN)		
11	BRIDGEWATER STATE	BRIDGE	1623	X			X	X	X	X	X	X (SEN,JUN,SOPH)		
12	CLARK UNIVERSITY	CLARK	98	X			X	X	X	X	X	X (SEN,JUN,SOPH)		
13	COLL. LADY OF ELMS.	COLELM	149	X			X	X	X	X	X	X (SEN,JUN,SOPH,FRESH)		
14	CURRY COLLEGE					X								DID NOT SUPPLY DATA
15	EAST. NAZ. COLL.	ENAZ	245	X				X	X	X	X	X (SEN,JUN,SOPH)	X	
16	EMMANUEL COLLEGE	EMMANUEL	108	X				X	X	X	X	X (SEN,JUN,SOPH)		NO GRAD YR FOR GRAD NON DEG STU.
17	FITCHBURG STATE	FITCH	1485	X				X	X	X	X	X (SEN,JUN,SOPH,FRESH)	X	NO GRAD LEVEL STUDENTS IN 86-87
18	FRAMINGHAM STATE	FRAMING	583	X				X	X	X	X	X (SEN,JUN,SOPH)		DATA GIVEN ON TWO FILES
19	GORDON COLLEGE	GORDON	271	X			X	X	X	X	X	X (SEN,JUN,SOPH)		
20	HARVARD GRAD SCHOOL				X*			X	X	X	X	X (SEN,JUN,SOPH)		PROVIDED ONLY AGGREGATE DATA
21	HARVARD U-DIVINITY					X								
22	LESLEY COLLEGE	LESLEY	207	X						X	X	X (SEN,JUN,SOPH)	X	NO SPECS-ONLY BACH.ED + MASTERS.ED
23	MASS. COLL. OF ART	MASSCART	119	X				X	X	X	X	X (SEN,JUN,SOPH)	X	
24	MERRIMACK COLLEGE	MERRI	50	X			X		X			X (SEN,JUN)		
25	MOUNT HOLYOKE COLL.	MHOLYOKE	42	X				X	X	X	X		X	GRAD LEVEL STUDENTS ONLY IN 85

TABLE I.1

TEACHER SUPPLY/DEMAND SURVEY DATA BASE

CODE	SCHOOL NAME	ABREV.	# RECS	SURVEY STATUS			SURVEY DATA YEARS						GRAD LEVEL PROG	COMMENTS
				IN	NOT IN	NOT PARTIC	GRADS 82	GRADS 83	GRADS 84	GRADS 85	GRADS 86	CURRENT ENROLLMENT 86-87		
26	NEW ENG.CONS.MUSIC	NECONMUS	16	X				X	X	X	X	X (SEN,JUN,SOPH)		GRAD LEVEL STUDENTS ONLY 1985+86
27	NORTH ADAMS STATE	NADAMS	351	X			X	X	X	X	X	X (SEN,JUN,SOPH)		
28	NORTHEAST. UNIV.	NEASTERN	858	X	.				X	X	X	X (SEN,JUN,SOPH,FRESH)	X	CURRENT ENROLLMENT OFF BY ONE YEAR
29	PINE MANOR COLL.					X							X	DOES NOT HAVE CURRENT CERT. PROG.
30	REGIS COLLEGE	REGIS	98	X				X	X	X	X	X (SEN,JUN,SOPH)		
31	SALEM STATE COLL.	SALEM	1377	X			X	X	X	X	X	X (SEN,JUN,SOPH,FRESH)	X	86-87 & CONT.ED STUDDS CONFUSED
32	SIMMONS COLLEGE	SIMMONS	184	X				X	X	X	X	X (SEN,JUN,SOPH)	X	NO GRAD LEVEL STUDENTS IN 86-87
33	SMITH COLLEGE	SMITH	46	X				X	X	X	X			
34	SOUTHEAST.MASS.COLL.	SEASTERN	422	X				X	X	X	X	X (SEN,JUN,SOPH)	X	LARGE # NON-DEGREE STUDENTS
35	SPRINGFIELD COLL.					X								
36	STONEHILL COLLEGE	STONE	173	X				X	X	X	X			
37	SUFFOLK COLLEGE	SUFFOLK	91	X		X		X	X	X	X	X (SEN,JUN,SOPH)		INCLUDES SOME GRADS BEFORE 82'
38	TUFTS UNIV.					X								
39	UNIV. OF LOWEL	LOWEL	132	X				X	X	X	X			
40	U. OF MASS. AMHERST	UMASSAM	869	X			X	X	X	X	X		X	82 INFORMATION SPORADIC
41	U. OF MASS. BOSTON	UMASSBOS	507	X				X	X	X	X	X (SEN,JUN,SOPH,FRESH)	X	
42	WELLESLEY COLL.	WELLESLE	42	X				X	X	X	X			
43	WEST. NEW ENG. COLL.	WENEC	68	X				X	X	X	X	X (SEN,JUN,SOPH)		84 INFORMATION SPORADIC
44	WESTFIELD STATE	WFIELD	1663	X			X	X	X	X	X	X (SEN,JUN)		85 INFORMATION SPORADIC
45	WHEATON COLLEGE	WHEAT	64	X			X	X	X	X	X	X (SEN,JUN)		
46	WHEELOCK COLLEGE	WHEELOCK	366	X					X	X	X			
47	WORCESTER STATE COLL.	WORCSTAT	755	X				X	X	X	X	X (SEN,JUN,SOPH)	X	ONLY GAVE 1 SOPH. STUDENT

EXHIBIT I.1

THE COMMONWEALTH OF MASSACHUSETTS

BOARD OF REGENTS OF HIGHER EDUCATION

ROOM 619, McCORMACK BUILDING

ONE ASHBURTON PLACE

BOSTON, MASSACHUSETTS 02108-1530

Dear :

The Board of Regents, the Department of Education and the Mass Higher Education Assistance Corporation are sponsoring this study as part of the Statewide Review of Education. This involves establishing a quantitative model of the balance between supply and demand and the flow of teachers into and out of the pool of teachers. In order to estimate the flow of teachers from Massachusetts' post-secondary institutions to teaching positions in Massachusetts at the primary and secondary level, data are necessary for individual students enrolled in programs leading to teacher certification. The data that we need include the following:

1) Social Security Number
2) Birth Date
3) State of Residence at Time of Initial Enrollment
4) Certificate(s) Pursued or Major
5) Year of Graduation/Current Class Level
6) Year of First Entrance to your College
7) Status on Entry: Transfer, First time Freshmen (non-transfer), Graduate, Non-degree
8) Minority Status
9) Sex

We request your help in providing these data for school years Fall 1982-83 to Fall 1985-86. One of the benefits of your participation is that we shall produce an individualized report for you on how many of your past graduates are currently teaching, or have taught, in Massachusetts.

We request data items 1-9 as described above, for undergraduates currently enrolled in programs leading to certification. As well, we

also request data items 1 - 9 for graduated students of undergraduate
and/or graduate programs leading to certification for academic years
1982-83 to 1985-86. The data most critical to this study are that
for the graduated students for the academic year Fall 1984 - Spring
1985. That data will provide the necessary information to calculate
the most recent transition of students in Massachusetts' programs
leading to certification into the teaching labor force. The
additional past years of graduated student data that you provide will
allow estimation of the percentage of students with lagged entry into
the teaching labor force.

These data need to be provided as expeditiously as possible since
we would like to complete the study by September 1986. Therefore, it
would be helpful if you would give an immediate response to indicate
the amount of time you need to comply to this request or to indicate
the difficulty in providing certain years or categories of data. We
hoped you would submit your data no later than August 1, but with the
need for this follow-up letter, we can extend that to August 15.

Any questions concerning this request should be directed to the
organization conducting this research, the Massachusetts Institute
for Social and Economic Research (MISER). The person to contact is
James Wilson, Senior Project Analyst for MISER (413-545-3460).

Sincerely,

Stephen P. Coelen   James M. Wilson
Director   Senior Project Analyst
MISER   MISER

EXHIBIT I.2
Description of Data Elements Requested

1) Social Security Number: 9 digit Social Security Code

2) Birth Date: Enter this in the form: Month, Day, Year. Six
   digit code - for example, 061755.

3) State of Residence at time of intial enrollment: 2 letter
   State Code (e.g., Massachusetts = MA, Maine = ME, etc.)

4) Certificate(s) Pursued or Major

5) Year of Graduation from undergraduate or graduate programs
   leading to certification, for graduates or class level for
   current undergraduates in programs leading to certification.
   Four digit code, for example, 1984, SENR, JUNR, SOPH, FRES.

6) Year of First Entrance to your College. Four digit code, for
   example, 1975.

7) Status of Entry: Transfer, 1st Time Freshmen (non-transfer).
   One digit code, T-Transfer, N-Nontransfer, G-Graduate,
   D=Nondegree.

8) Minority Status: Black, White, Hispanic, Other. One digit
   code, B, W, H, O.

9) Sex: Male = M; Female = F. One digit code.

EXHIBIT I.2

GRADUATES

1 Social Security Number	2 Birth Date	3 State of Residence	4 Certificate(s) Pursued or Major	5 Year of Graduation	6 Year of Entrance	7 Status on Entry	8 Minority Status	9 Sex

CURRENT UNDERGRADUATES

1	2	3	4	5	6	7	8	9
Social Security Number	Birth Date	State of Residence	Certificate(s) Pursued or Major	Current Class Level	Year of Entrance	Status on Entry	Minority Status	Sex

Membership Blank

EXHIBIT I.3

This Blank should be filled out by all teachers ENTERING OR RE-ENTERING service or transferring from one job title to another within a school department/collaborative, or transferring from one city or town to another, or into the employ of a Collaborative formed under G.L. c.40, s.4E. In order that the Retirement Board may determine whether or not membership is required. Information regarding the requirements for membership is given on the other side of this blank.) PLEASE RETURN BLANK TO THE OFFICE OF SUPERINTENDENT OF SCHOOLS, OR TO THE COLLABORATIVE DIRECTOR when completed.

TO BE FILLED OUT BY THE EMPLOYEE

I _____ HAVE ACCEPTED a position in the _____
Type or Print Full Name   *(City, Towns in Union, Regional School District or Collaborative) in Massachusetts*

and in accordance with the requirements of the Teachers' Retirement Board the following information is furnished, and I understand that if membership is required, 8% of my regular compensation due on each pay day will be deducted and deposited to my credit in the annuity savings fund, pursuant to G.L. c. 32 s.22(1)(b). (A 5% deduction is required for those persons enrolled prior to January 1, 1975, whose money remains on deposit. A 7% deduction is required for those persons enrolled prior to January 1, 1984, whose money remains on deposit.)

1. Signature _____ Soc. Sec. # _____ Sex _____

2. Veterans status (Yes or No) _____ If yes, state service dates _____
   (A copy of discharge papers should also be provided)

3. Permanent address _____
        Street and Number   *City or Town*   *State and Zip*   *Home Tel. No.*

4. (a) Date of birth _____ Place of birth _____
   If not previously filed, copy of birth record must be filed with the Retirement Board upon enrollment and also marriage record if married.

   (b) Father's Full Name _____ Mother's Full Name _____

5. Have you at any time been a member of the Massachusetts Teachers' Retirement System? Yes or no _____

   (a) Your name when you were last a member _____

   (b) What was the last system in which you were employed in a position subject to membership in the Teachers' Retirement System?
   (Do not include periods of employment for the City of Boston) _____

   Date when your services were terminated _____

   (c) Did you withdraw funds from the MA Teachers' Retirement System after leaving your previous teaching position? Yes or no _____

6. State below all previous public day school service, *including service in other states and service in a Collaborative.* (If none, please so state.) Continuous service as a substitute, temporary, or part-time teacher, if six months or more, should be so designated and reported. (Attach another sheet if more space is needed).

CITY OR TOWN	STATE	FROM Month	Day	Year	TO Month	Day	Year	REMARKS

7. Have you at *any time* been a member of *any other* contributory retirement system for public employees established under the laws of Massachusetts? Yes or no _____ Name of system _____
   (a) Date service terminated _____
   (b) Your name when last a member of such other system _____
   (c) Have you now any funds in such other system? _____

8. State below all periods of employment by the Commonwealth of Massachusetts or any political subdivision thereof, other than as a teacher in the public day schools or Collaborative. (Attach another sheet if needed.)

GOVERNMENTAL UNIT	DEPARTMENT	FROM Month	Day	Year	TO Month	Day	Year

TO BE FILLED OUT BY THE EMPLOYER

9. Title of Position as stated in Contract _____ Starting Date _____

10. In position accepted above, will (s)he be a part-time teacher? Yes or no _____ If part-time, report % of full-time service _____

11. In position accepted, will (s)he be a substitute or temporary teacher? Yes or no _____ Name of School _____

12. The first retirement deduction will be withheld on _____ in the amount of _____, which represents _____ % of regular compensation paid during the payroll period

EXHIBIT I.3

INFORMATION AND DEFINITION REGARDING COMPULSORY MEMBERSHIP IN THE TEACHERS' RETIREMENT SYSTEM.

Membership in the Teachers' Retirement System is required for all persons defined as teachers who enter the service for the first time, also for all teachers who reenter the service, irrespective of former membership, except that the following are excluded from membership:

A. A teacher age 65 or over on the date of becoming an employee who was never a member of a contributory retirement system for public employees established under laws of Massachusetts.

B. A former member of a contributory retirement system for public employees established under the laws of Massachusetts who reenters the service as a teacher at age 65 or over but under age 68 who does not return the amount withdrawn with accumulated interest.

C. A former member who reenters the service at age 68 or over.

General Laws section 1, chapter 32 defines a teacher as any person who is employed by one or more school committees or boards of trustees, or by a c.40 s.4E Collaborative, or by any combination of such, on a basis of not less than half-time as a:

Teacher
School Psychologist
School Psychiatrist
School Adjustment Counselor appointed under section 46G, chapter 71
Director of Occupational Guidance and Placement appointed under section 38A or 38D, chapter 71
Principal, Supervisor or Superintendent in any public school as defined in this section, or a Collaborative Director
Supervisor or teacher of adult civic education

— but excluding any person serving as an exchange teacher in any public school or Collaborative unless the person is a member of the Teachers' Retirement System at the time of entry into such service; provided that "teacher" shall not be deemed to include, nor shall sections 1 to 28 inclusive apply, to any person who is a teacher in the public schools of the city of Boston.

A public school is defined as any day school conducted in the Commonwealth under the superintendence of a duly elected school committee, also any day school conducted under the provisions of sections 1 to 37 inclusive of chapter 74. Note: These sections relate to vocational and county agricultural schools. C.40 s.4E Collaboratives are deemed to be public schools pursuant to G.L.c.32s1.

•PART-TIME TEACHER

• A teacher employed at least half-time or more on a part-time basis for a period in excess of six consecutive months will be subject to the membership requirements of full-time employees at the conclusion of the six-month period. The only exception to this rule is in the case of persons re-entering service on a part-time basis with monies on deposit in this retirement system (or another Massachusetts public contributory retirement system) who will become members immediately upon re-employment without waiting six months.

•SUBSTITUTE OR TEMPORARY TEACHER

• A substitute or temporary teacher entering or re-entering the service, irrespective of membership or former membership in a contributory retirement system for public employees established under the laws of Massachusetts must be employed for the 6 consecutive calendar months that the school in which employed is in session before being eligible to become a member, and will then be subject to the membership requirements as explained above for a full-time teacher, if continued as a substitute or temporary teacher with no break in service.

A member of the Teachers' Retirement System may withdraw his/her funds provided that he/she has:

— officially terminated his/her position (leave of absence will not suffice)
— not attained age 55
— agreed to waive his/her rights to a retirement allowance, if eligible
— not become a member of another Massachusetts public contributory retirement system

N.B. Upon withdrawal a member who has accrued at least 10.0 years of creditable service and for all members who are involuntarily terminated regardless of years of service will receive a refund of all member contributions with regular interest thereon as computed during the members active service and for two years following resignation or termination. A member who has accrued at least 5.0 years but less than 10.0 years of creditable service will receive a refund of all contributions together with 50% of the regular interest thereon as computed during the members active service and for two years following resignation. A member who has accrued less that 5.0 years of service will receive a refund of contributions only. For members whose funds have been on deposit since prior to January 1, 1984, the member will receive a refund of all member contributions with regular interest and for two years following resignation.

If employed after the date of last separation, the amount withdrawn, with accumulated interest, may be returned while a member and prior to the date retirement is to take effect.

A member in service may establish credit for SERVICE IN OTHER STATES as a teacher, principal, supervisor or superintendent in the public day schools or other day schools under exclusive public control and supervision, or as a teacher, principal, superintendent or president in a state normal school, state teachers college or like institution, or other college under exclusive public control and supervision, or as an employee in a state department of education as supervisor of teachers or educational methods. A member cannot, however, receive credit for service in other states in excess of the Massachusetts service credit entitlement at age 65 or on the date of retirement, whichever occurs first. Credit cannot be allowed for more than 10 years service in other states. Service for which a member desires to establish credit must be verified on forms furnished by the Retirement Board, and the member must pay the deductions amount which would have been paid if the service had been rendered in Massachusetts, with accumulated interest to date of payment.

Membership is mandatory for all persons employed as "teachers" in a public day school or Collaborative and is not discretionary under any circumstances. Collaborative employees must submit a copy of their teaching certification from the Massachusetts Department of Education

TABLE I.2   TEACHER SUPPLY AND DEMAND INTEGRATED DATA FILE   page 2

YEARS OF EMPLOYMENT (AS OF 1972)
    FIRST YEAR
    LAST YEAR
    1972 (ACADEMIC YEAR)
        MONTHS TAUGHT FROM 9/72 - 12/72
        MONTHS TAUGHT FROM 1/73 - 6/73
    ***   THE LAST THREE ENTRIES ARE REPEATED   ***
    ***   FOR THE YEARS 1973 THROUGH 1986   ***

REFUND, RETIREMENT, AND BUYBACK TRANSACTIONS (AS OF 1972)
    REFUND ONE   0/1 = NO/YES
    DATE OF FIRST REFUND
    REFUND TWO   0/1 = NO/YES
    DATE OF SECOND REFUND
    REFUND THREE   0/1 = NO/YES
    DATE OF THIRD REFUND
    BUYBACK ONE   0/1 = NO/YES
    DATE OF FIRST BUYBACK
    BUYBACK TWO   0/1 = NO/YES
    DATE OF SECOND BUYBACK
    BUYBACK THREE   0/1 = NO/YES
    DATE OF THIRD BUYBACK
    RETIREMENT ONE   0/1 = NO/YES
    DATE OF FIRST RETIREMENT
    RETIREMENT TWO   0/1 = NO/YES
    DATE OF SECOND RETIREMENT
    RETIREMENT THREE   0/1 = NO/YES
    DATE OF THIRD RETIREMENT
    REFUND INDICATOR   (9 = MORE THAN 3)
    BUYBACK INDICATOR   (9 = MORE THAN 3)
    RETIREMENT INDICATOR   (9 = MORE THAT 3)

SUMMARY OF EMPLOYMENT HISTORY (AS OF 1972)
    ACTIVITY IN 1972 (ACADEMIC YEAR - 9/72 THRU 6/73)
    ***   THIS ENTRY IS REPEATED FOR THE ACADEMIC   ***
    ***   YEARS 1973 THROUGH 1986.   THE VALUES IN ***
    ***   THESE FIELDS INDICATE WHETHER A PERSON   ***
    ***   TAUGHT THE COMPLETE ACADEMIC YEAR. HALF   ***
    ***   THE ACADEMIC YEAR. WAS ON LEAVE, TOOK A   ***
    ***   REFUND. OR RETIRED.   ***

GENERAL INFORMATION

SOCIAL SECURITY NUMBER
PERSON NUMBER   ** FROM THE MTRB **
NAME   ** FROM THE MTRB OR ELSE THE BOC **
DATE OF BIRTH   ** FROM THE SURVEY OR ELSE THE MTRB **
SEX   ** FROM THE SURVEY OR ELSE THE MTRB **
MINORITY STATUS   ** FROM THE SURVEY **

FLAGS

RECORD PRESENT IN THE SURVEY FILE   0/1 = no/yes
RECORD PRESENT IN THE BOC FILE   0/1 = no/yes
RECORD PRESENT IN THE MTRB FILE   0/1 = no/yes

IN-STATE SCHOOL BACKGROUND   ** FROM THE SURVEY **

SCHOOL CODE
NAME OF COLLEGE/UNIVERSITY
1985-86 CLASS LEVEL
YEAR GRADUATED
YEAR OF FIRST ENTRANCE
YEARS FROM ENTRANCE TO GRADUATION
STATUS ON ENTRY
CERTIFICATE PURSUED 1
CERTIFICATE PURSUED 2
STATE OF RESIDENCE - AT TIME OF ENROLLMENT

CERTIFICATION HISTORY   ** FROM THE BOC **

CERTIFICATE NUMBER
DATE OF FIRST CERTIFICATION
FIELDS OF CERTIFICATION (TEN FIELDS)
STATUS OF APPLICATION (APPROVED OR PENDING) (TEN FIELDS)

EMPLOYMENT HISTORY   ** FROM THE MTRB **

GENERAL INFORMATION
   LAST ACTIVITY DATE
   ENTRANCE DATE
   LAST CONTRIBUTION DATE
   LAST AGENCY WHICH CONTRIBUTED
   RATE OF CONTRIBUTION

Appendix II: Aggregation of Ceritification Categories

The number of certifcation categories avialable at the
BOC were   aggregated into   20 total categories.   The
aggregation was based on similarity.   The table of the
following page   presents the   20 categories   and   the
certifications which comprise each of these 20 categories.

1: 79 Principal
    80 School Business Administrator
    81 Supervisor/Director
    85 Superintendant

2: 75 School Psychologist
    76 Guidance Counselor

3: 74 Unified Media Specialist
    84 Librarian

4: 10 English as a Second Language
        Bilingual for all Categories

5:   2 Young Children with Special Needs
    46 Consulting Teacher of Reading
    49 Speech
    51 Generic Consulting Teacher
    52 Children with Severe Special Needs
    53 Children with Moderate Special Needs
    57 Children with Hearing & Language
          Disorders
    59 Children with Special Needs: Vision
    60 Children with Special Needs: Audition

6:   3 Early Childhood

7:   4 Elementary
     5 Middle School

8: 11 English

9: 15 Math
    32 Math & Science

10: 19 General Science
    20 Earth Science

11: 18 Biology

12: 17 Physics

13: 16 Chemistry

14: 12 History
    13 Geography
    14 Social Studies
    33 Behavioral Sciences

15: 21 French

16: 23 Spanish

17: 22 German
    24 Italian
    25 Russian
    26 Polish
    27 Portugese
    28 Modern Foreign
          Languages
    31 Latin & Classical
          Humanities

18: 40 Physical Education
    42 Health

19: 36 Dance
    37 Drama
    47 Art
    48 Music

20: 34 Secretarial Skills
    35 Business Management
    43 Business
    44 Home Economics
    45 Industrial Arts

Appendix III: Technical Documentation of the Model

------------------->FORTHCOMING<-------------------

Appendix IV: Certification Forms and Directions

The attached exhibits are the forms and directions used
by individuals applying for certification.

APPLYING FOR CERTIFICATION IN MASSACHUSETTS

1. Documents Needed:

It is best to submit all documents together with your application. If you must submit documents under separate cover, please request that your social security number be listed on the documents.

1. **Completed application** - You may apply for more than one certificate on the same application card.

2. **Check or money order*** payable to Commonwealth of Massachusetts to cover the application fee of $10.00 for **each** field and **each** level (see Page 4). We will evaluate only those areas for which appropriate application fee is submitted. The fee is non-returnable. Applications will remain active until all requirements have been completed. There is **no** fee for Teachers of Transitional Bilingual Education. For example:

<u>11-F</u>	= $10.00 fee (English - grades 9-12)
<u>48-G</u>, <u>48-H</u>	= $20.00 fee (Music - grades K-9 <u>and</u> Music - grades 5-12)
<u>79-E</u>	= $10.00 fee (Principal - grades 5-9)
<u>04-D</u>, <u>B04D</u>	= $10.00 fee (Elementary Teacher and Bilingual Elementary Teacher grades 1-6 - no fee for Bilingual)

   * Those applying through their Massachusetts college must submit a <u>bank</u> check or money order.

3. **Proof of U.S. citizenship** status - An American birth certificate, voter's registration card or Naturalization Certificate is acceptable proof of U.S. citizenship. Non-citizens must submit proof they have filed a Declaration of Intention to become a citizen with the U.S. Immigration and Naturalization Service. Those applying for bilingual certification may submit any of the above <u>or</u> proof of legal presence in the U.S. and authorization for employment. Not necessary if you are already certified in Massachusetts.

4. **Official transcript(s)** - Copies of official transcripts (with legible Registrar's signature) will be accepted. You must resubmit all appropriate transcripts when applying for additional certification. Transcripts from most foreign countries must be reviewed for equivalency by an official transcript evaluation service identified by this Bureau.

5. **Medical certificate** (on supplementary sheet) - Your medical exam must have been within one year of the date we receive your application. Not necessary if you are already certified in Massachusetts.

6. **Proof of any name changes.** (copy of marriage certificate, court order or similar evidence of name change will be accepted.)

7. **Tax Form** (on supplementary sheet) - Required of ALL who apply for Massachusetts certification.

II. Major Routes to Certification:

Please read the following carefully to determine the documentation you need to submit in support of your certification application. In addition, please answer the supplementary sheet.

1. <u>Massachusetts Approved Program</u>

   If you have completed a program of preparation approved by the <u>Massachusetts Board of Education</u> you should submit:

   a) completed application (see Page 1).
   b) a statement from the college validating completion of the state approved program indicating the field and grade level (either in letter form or an actual statement stamped on your official transcript). For additional information, contact the Certification Officer at your college/university.
   c) a completed Massachusetts practicum/internship report.

2. <u>Massachusetts Individual Route</u>

   If you have completed <u>a program in Massachusetts registered with the Bureau,</u> or one that was pre-designed to address Massachusetts competency Standards, you should submit:

   a) completed application (see Page 1).
   b) a complete official transcript.
   c) a completed Massachusetts practicum/internship report.

3. <u>Interstate Approved Program</u> (Not available for Administrative Certification)

   If you have completed a program in a state with which Massachusetts signed the Interstate Agreement on Certification of Educational Personnel (see supplementary sheet) you should submit:

   a) completed application (see Page 1).
   b) a statement on official college letterhead signed by the designated college official (usually Registrar or Dean) testifying that you have completed a <u>state approved program</u> in your area of concentration.* Keep in mind that the statement must indicate that <u>you</u> completed this program rather than that the college has approved programs.

   *This or an equivalent statement may appear on the transcript.

4. <u>Interstate Experienced Educator Route</u>

   If you are certified in a state with which Massachusetts has signed the Agreement (see supplementary sheet) and have been successfully employed under the certificate for at least three of the last seven years in that state, you should submit:

   a) completed application (see Page 1).
   b) an experience letter signed by the Superintendent on official school letterhead validating three years of experience within the past seven years. Included should be the dates of employment, grade level and job title.
   c) proof of certification while so employed.

NOTE: The Interstate Agreement does <u>not</u> provide automatic reciprocity. There are conditions which must be met (see # II-3 & II-4 above).

5. <u>Additional Certification in Massachusetts - New Level and/or New Field</u>

If you are certified in Massachusetts and are requesting a certificate in a new teaching field and/or a new grade level, you should submit:

a) completed application.
b) official transcripts.

We will then advise you of your needs.

III Other Routes:

Unless you can qualify for one of the Major Routes (see 1-5 above), you will need to do additional work. In most cases this will include <u>at least</u> a practicum or internship, conducted under Massachusetts regulations during which you will be required to demonstrate Board of Education established competencies. (Previously completed field experiences will not qualify.)

For a full evaluation, you should submit the following:

a) completed application.
b) answered questions (see supplementary sheet).

We will then advise you of your status and additional needs.

NOTE: Although certificates may be granted for broad grade levels (e.g. K-12) in other states, most initial certificates in Massachusetts are issued for narrower grade levels (e.g. (1-6), (5-12). The specifics of how one may add additional grade levels will be provided to those who apply with the appropriate application fee for those additional levels.

The following certification areas require that evidence of a pre-requisite certificate (in Massachusetts or any other state) and/or experience be submitted. Those which require prior certification are the following:

> Children with Moderate Special Needs (53)
> Children with Special Needs: Vision (59)
> Children with Special Needs: Audition (60)
> Unifed Media Specialist (74)

Those which require prior certification and experience in the role covered by that certificate are:

> Consulting Teacher of Reading (46)
> Generic Consulting Teacher (51)
> Principal (79)
> School Business Administrator (80)
> Supervisor/Director (81)
> Superintendent/Asst. Superintendent (85)

On item #6 on your application, you should indicate by number and letter the field(s) and (
vel(s) for which you are applying. The letters beside the code numbers are the only
vels at which that particular area is available. There are no other certificates issued
other than those listed below. There is a $10.00 fee for each (field and level)
requested.

FIELDS AND LEVELS OF CERTIFICATIONS

Code	Field	Code	Field
(S)	Young Children with Special Needs	53(H,J)	Children with Moderate Special Needs
2C	Early Childhood	57(L) *	Children with Hearing and Language Disorders
(D)	Elementary		
5(E)	Middle School	59(L)	Children with Special Needs: Vision
0(C,D,E,F)	English as a Second Language		
(C,D,E,F)	English	60(L)	Children with Special Needs: Audition
2(C,D,E,F)	History		
3(C,D,E,F)	Geography	74(H,J)	Unified Media Specialist
(C,D,E,F)	Social Studies	75(L)	School Psychologist
5(C,D,E,F)	Math	76(H,J)	Guidance Counselor
6(C,D,E,F)	Chemistry	79(A,E,F)	Principal
7(C,D,E,F)	Physics	80(L)	School Business Administrator
8(C,D,E,F)	Biology		
9(C,D,E,F)	General Science	81(T)	Supervisor/Director
0(C,D,E,F)	Earth Science	85(L)	Superintendent
(C,D,E,F)	French		
2(C,D,E,F)	German		
3(C,D,E,F)	Spanish		

Use prefix "B" for Bilingual Teacher

Code	Field
(C,D,E,F)	Italian
5(C,D,E,F)	Russian
6(C,D,E,F)	Polish
7(C,D,E,F)	Portuguese
8(C,D,E,F)	Modern Foreign Language (Other)
1(C,D,E,F)	Latin and Classical Humanities
2(C,D,E,F)	Math and Science
3(C,D,E,F)	Behavioral Sciences
4(G,H)	Secretarial Skills
5(G,H)	Business Management
6(G,H)	Dance
7(G,H)	Drama
0(G,H)	Physical Education
2(G,H)	Health
3(G,H)	Business
4(G,H)	Home Economics
5(G,H)	Industrial Arts
6(L)	Consulting Teacher of Reading
8(G,H)	Music
9(C,D,E,F)	Speech
1(L)	Generic Consulting Teacher
2(L)	Children with Severe Special Needs

Key to Suffixes

A   Nursery through grade six (N-6)
C   Kindergarten through grade three (K-3)
D   Grades one through six (1-6)
E   Grades five through nine (5-9)
F   Grades nine through twelve (9-12)
G   Kindergarten through grade nine (K-9)
H   Grades five through twelve (5-12)
J   Nursery through grade nine (N-9)
L   All levels
S   Preschool (3-7 year olds)
T   Level depends upon prerequisite certificate

*   Those with this certificate will also
    need a license by:
       The Board of Registration for
       Speech-Language Pathology and
       Audiology
       100 Cambridge Street
       Boston, MA 02202
       (617)727-1747
    to practice speech pathology and
    audiology in the state.

Appendix V: EEO-5 Forms

Attached is the Equal Employment Opportunity form number 5 used to collect information on minority edcuational staff by the federal government.

EQUAL EMPLOYMENT OPPORTUNITY COMMISSION

ELEMENTARY-SECONDARY STAFF INFORMATION (EEO-5)

Public school systems (Schools and Annexes)

* BEGINNING WITH THIS 1982
* MAILOUT, THE EEO-5 SURVEY
* WILL BE CONDUCTED BIENNIALLY
* IN EVEN YEARS

NOTE Instructions for filing are given in the enclosed booklet. Additional copies of this form may be obtained from your district superintendent. ➜

SEND COMPLETED COPIES OF THIS FORM TO: YOUR DISTRICT SUPERINTENDENT FOR TRANSMITTAL TO WASHINGTON BY THE FILING DEADLINE.

YOUR SCHOOL DISTRICT SUPERINTENDENT (FOR FORWARDING TO THE SCHOOL REPORTING COMMITTEE EEO-5)

TYPE OF REPORT ☐ INDIVIDUAL SCHOOL ☐ ANNEX

PART I. IDENTIFICATION

A. TYPE OF AGENCY WHICH OPERATES THE REPORTING SCHOOL SYSTEM OR SCHOOL

☐ Local Public School System   ☐ State Education Agency
☐ Special or Regional Agency   ☐ Other (Specify) _____

B. SCHOOL SYSTEM IDENTIFICATION (OMIT IF SAME AS LABEL)

NAME

STREET AND NO. OR POST OFFICE BOX	CITY/TOWN	COUNTY	STATE	ZIP

C. SCHOOL INFORMATION

1. IDENTIFICATION

NAME

STREET AND NO. OR POST OFFICE BOX	CITY/TOWN	COUNTY	STATE	ZIP

2. GRADES OFFERED (PLACE AN "X" UNDER EACH GRADE OFFERED IN THIS SCHOOL)

Pre-K	K	1	2	3	4	5	6	7	8	9	10	11	12	Ungraded	Special Education	OCTOBER 1ST ENROLLMENT
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	

3. INFORMATION ABOUT PRINCIPAL (CHECK AS APPROPRIATE)

IS A PRINCIPAL ASSIGNED TO THIS SCHOOL? ☐ YES ☐ NO

SEX

IF YES   ☐ FULL TIME ☐ PART TIME

☐ MALE ☐ FEMALE

IF FULL-TIME, DOES THE PRINCIPAL HAVE A TEACHING ASSIGNMENT?

RACE/ETHNIC IDENTITY (CHECK ONE)
☐ WHITE (NOT OF HISPANIC ORIGIN)   ☐ BLACK (NOT OF HISPANIC ORIGIN)   ☐ HISPANIC

☐ YES   ☐ NO

☐ ASIAN OR PACIFIC ISLANDER   ☐ AMERICAN INDIAN OR ALASKAN NATIVE

ACTIVITY ASSIGNMENT CLASSIFICATION	OVERALL TOTALS (SUM OF COL. B THRU K)	STAFF TOTALS									
		MALE					FEMALE				
		WHITE (NOT OF HISPANIC ORIGIN)	BLACK (NOT OF HISPANIC ORIGIN)	HISPANIC	ASIAN OR PACIFIC ISLANDER	AMERICAN INDIAN OR ALASKAN NATIVE	WHITE (NOT OF HISPANIC ORIGIN)	BLACK (NOT OF HISPANIC ORIGIN)	HISPANIC	ASIAN OR PACIFIC ISLANDER	AMERICAN INDIAN OR ALASKAN NATIVE
	A	B	C	D	E	F	G	H	I	J	K

A. FULL TIME STAFF

Officials, Administrators, Managers											
Principals											
Assistant Principals, Teaching											
Assistant Principals, Nonteaching											
Elementary Classroom Teachers											
Secondary Classroom Teachers											
Other Classroom Teachers											
Guidance											
Psychological											
Librarians/Audiovisual Staff											
Consultants & Supervisors of Instruction											
Other Professional Staff											
Teacher Aides											
Technicians											
Clerical/Secretarial Staff											
Service Workers											
Skilled Crafts											
Laborers, Unskilled											
TOTAL (1-18)											

B. PART-TIME STAFF

Professional Instructional											
All Other											
TOTAL (20-21)											

C. NEW HIRES (JULY THRU SEPT. OF THE SURVEY YEAR)

Officials, Administrators, Managers											
Principals/Asst. Principals											
Classroom Teachers											
Other Professional Staff											
Nonprofessional Staff											
TOTAL (23-27)											

CERTIFICATION: I certify that the information given in this report is correct and true to the best of my knowledge and was prepared in accordance with accompanying instructions. Willfully false statements on this report are punishable by law, U.S. Code, Title 18, Section 1001.

Phone (Include Area Code)	Typed Name/Title of Person Responsible for Report	Signature

Appendix VI: Regression Results

---------->FORTHCOMING<----------

Appendix VII: California Opscan Survey Forms

Attached is the survey form used by the Califronia
Department of Edcuation to collect data on teachers in their
state.

CBEDS

California Basic Educational Data System

California State Department of Education

October 1984

Professional Assignment Information Form
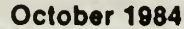
- Use a No. 2 pencil to mark this form.
- Print the requested information in the boxes above the circle grids, then make heavy black marks that fill the circles corresponding to the letters or numbers you have printed
- Erase cleanly any response you wish to change; make no stray marks of any kind.
- School personnel should return the completed form to the school principal; district and county office personnel should return the form to their CBEDS Coordinator.

COUNTY
DISTRICT
SCHOOL

Before completing this form, read the *Professional Assignment Information Form Supplement*

LAST NAME

FIRST NAME

M.I.

HIGHEST EDUCATIONAL LEVEL

(MARK ONE)

- ○ Doctorate
- ○ Master's degree plus 30 or more semester hours
- ○ Master's degree
- ○ Bachelor's degree plus 30 or more semester hours
- ○ Bachelor's degree
- ○ Less than bachelor's degree

ETHNIC GROUP

(MARK ONE)

- 1 ○ American Indian or Alaskan native
- 2 ○ Asian or Pacific Islander
- 3 ○ Filipino
- 4 ○ Hispanic
- 5 ○ Black, not of Hispanic origin
- 6 ○ White, not of Hispanic origin

SOCIAL SECURITY NUMBER

SEX

○ Male

○ Female

BIRTH YEAR

EDUCATIONAL SERVICE

Total Years of Educational Service

Total years of professional educational service including this year. Include service in this district, other states, and countries. Do not include substitute teaching. If service is less than 10 years, use a preceding zero; e.g., 08.

Years in This District
Total years in this district as a contracted professional including this year. If service is less than 10 years, use a preceding zero; e.g., 08

1. Assignment or Course Title

2. Assignment Code	3. Percent of Your Time Spent In This Assignment	4. Enrollment in this Class or Course	
	%	Male	Female

(bubbles 0–9)

(Grades 7-12 Only)

5. Grade Level of Majority of Students in This Class (MARK ONE)

○ 7   ○ 11
○ 8   ○ 12
○ 9   ○ Adult
○ 10

(Vocational Education Only)

6. Number of Special Students Enrolled in This Assignment

Limited English Proficient	Handicapped	Disadvantaged
○ None	○ None	○ None
○ 1 to 4	○ 1 to 4	○ 1 to 4
○ 5 to 9	○ 5 to 9	○ 5 to 9
○ 10 to 20	○ 10 to 20	○ 10 to 20
○ More than 20	○ More than 20	○ More than 20

---

1. Assignment or Course Title

2. Assignment Code	3. Percent of Your Time Spent In This Assignment	4. Enrollment in this Class or Course	
	%	Male	Female

(bubbles 0–9)

(Grades 7-12 Only)

5. Grade Level of Majority of Students in This Class (MARK ONE)

○ 7   ○ 11
○ 8   ○ 12
○ 9   ○ Adult
○ 10

(Vocational Education Only)

6. Number of Special Students Enrolled in This Assignment

Limited English Proficient	Handicapped	Disadvantaged
○ None	○ None	○ None
○ 1 to 4	○ 1 to 4	○ 1 to 4
○ 5 to 9	○ 5 to 9	○ 5 to 9
○ 10 to 20	○ 10 to 20	○ 10 to 20
○ More than 20	○ More than 20	○ More than 20

---

1. Assignment or Course Title

2. Assignment Code	3. Percent of Your Time Spent In This Assignment	4. Enrollment in this Class or Course	
	%	Male	Female

(bubbles 0–9)

(Grades 7-12 Only)

5. Grade Level of Majority of Students in This Class (MARK ONE)

○ 7   ○ 11
○ 8   ○ 12
○ 9   ○ Adult
○ 10

(Vocational Education Only)

6. Number of Special Students Enrolled in This Assignment

Limited English Proficient	Handicapped	Disadvantaged
○ None	○ None	○ None
○ 1 to 4	○ 1 to 4	○ 1 to 4
○ 5 to 9	○ 5 to 9	○ 5 to 9
○ 10 to 20	○ 10 to 20	○ 10 to 20
○ More than 20	○ More than 20	○ More than 20

---

1. Assignment or Course Title

2. Assignment Code	3. Percent of Your Time Spent In This Assignment	4. Enrollment in this Class or Course	
	%	Male	Female

(bubbles 0–9)

(Grades 7-12 Only)

5. Grade Level of Majority of Students in This Class (MARK ONE)

○ 7   ○ 11
○ 8   ○ 12
○ 9   ○ Adult
○ 10

(Vocational Education Only)

6. Number of Special Students Enrolled in This Assignment

Limited English Proficient	Handicapped	Disadvantaged
○ None	○ None	○ None
○ 1 to 4	○ 1 to 4	○ 1 to 4
○ 5 to 9	○ 5 to 9	○ 5 to 9
○ 10 to 20	○ 10 to 20	○ 10 to 20
○ More than 20	○ More than 20	○ More than 20

Contracted Salary. Print the dollar amount of your contracted salary for the current school year. Do not include pay for extra duties such as coaching, summer school teaching or Mentor Teacher. If salary is less than $10,000, use a preceding zero; e.g., 09215. Fill in the corresponding circles.

Position. Indicate whether your position is tenured, probationary or long-term substitute or temporary employee. Mark "other" if none of the above apply.

Special Authorization. Indicate if you are certificated to provide bilingual instruction (Do not include a waiver.), authorized as a Mentor Teacher, or teacher trainee.

Full or Part Time. Indicate whether your position is full time or part time as defined by the district. If you hold a part-time position, print the percent of a full-time position you hold. Fill in the corresponding circles.

SALARY AND POSITION

Contracted Salary

Position

- ◯ Tenured
- ◯ Probationary
- ◯ Long term substitute or temporary employee
- ◯ Other

Special Authorization

- ◯ Bilingual certification
- ◯ Mentor Teacher
- ◯ Teacher trainee

Full or Part Time

Is your position:
- ◯ Full time
- ◯ Part time

%

If part time, what percent of a full time position do you fill?

STATEMENT OF PURPOSE

The California State Department of Education uses information collected on this form for compiling certain state and federal reports and general-purpose statistics. The Department of Education may release the names of individuals to authorized professional organizations and may use the names of individuals in compiling professional directories. The names of individuals will not, however, be released in conjunction with other individual information. The social security number, which will be used exclusively as the unique identifier to maintain records, will not be released in conjunction with other individual information.

A Privacy Notification may be found in the *Professional Assignment Information Form Supplement.*

DO NOT MARK IN THIS AREA

24

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ELEM. PRINCIPAL	29.96	33.77	36.09	39.41
	59	96	301	191
SEC. PRINCIPAL	30.75	34.27	36.34	39.8
	35	84	303	166
LIBRARIAN	33.67	37	40.75	46.29
	22	47	142	56
SUPERINTENDENT	30.96	34.19	36.86	40.89
	22	31	94	97

	15	41	241	105	1
CONSULT. READING	32.77	34.5	37.68	41.72	
	117	194	531	248	
SPECIAL SUBJ:ART	29.5	31.12	35.44	37.91	
	56	135	410	137	
MUSIC	38.67	39.5	39	43.25	
	34	130	414	118	
SPEECH	32	37	37	44.5	
	6	28	62	26	
DRIVERS ED.	28.25	33.25	35.75	39	
	0	5	18	13	
GENERIC CONSULT.	0	22	22	34.5	
	0	4	6	12	
SEVERE SPEC. NEEDS.	0	0	0	27	
	0	0	3	23	
MOD. SPEC. NEEDS	37	35.08	34.39	34.43	
	16	6	21	91	49.8
AUDIO/VIS. SPEC.	29.5	33.25	37	40.75	
	9	17	46	23	
HEAR/LANG DIS.	28.43	33	32	34.75	
	13	84	167	135	
SPEC. NEED:VISION	0	0	0	0	
	0	0	0	1	
SPEC. NEED:AUDITION	0	0	0	0	
	0	0	0	6	
UNIF. MEDIA SPEC.	32	37	42	43.67	
	4	12	37	30	0.4
SCHOOL PSYCH.	30.33	34.06	36.75	39.63	
	33	60	136	103	
GUIDANCE COUNSLR	29.69	34.3	37	40.85	
	114	176	431	241	12.4
GUIDANCE DIR.	38.25	37.83	40.33	44.5	
	13	23	60	49	
PRINCIPAL	27.63	31.38	34.78	40.75	
	2	6	10	13	
SCHOOL BUS ADMIN	32	35	37.71	42.63	
	1	6	18	12	

ITALIAN	29	30.72	32.49	38.52	
	4	5	29	11	
RUSSIAN	32.83	36.44	41.44	44	
	2	1	10	5	1
POLISH	0	0	0	37	
	0	0	0	0	
PORTUGESE	29.35	31.47	34.46	37.99	
	0	8	22	9	.8
MODERN LANGUAGES	34.22	40.33	40.93	43.88	
	0	2	4	1	0.2
LATIN	34.14	38.43	43.43	51.38	
	12	14	32	10	4.4
GREEK	27	32	32	37	
	2	0	4	2	
LATIN & CLASSICS	37	42	47	47	
	0	0	1	1	
MATH & SCIENCE	24.5	32	34.5	37	
	0	6	7	13	
BEHAVIORAL SCI.	47	47	52	57	
	0	1	3	8	
SECRATERIAL SKILLS	0	0	0	0	
	0	0	0	0	
BUSINESS MGMT	0	0	0	32	
	0	0	3	5	
DANCE	0	0	0	0	
	0	0	0	0	
DRAMA	0	0	0	0	
	0	1	0	1	
PHYSICAL ED.	0	0	0	0	
	1	1	1	12	1
HEALTH	27	29.5	35.57	38.25	
	9	11	70	33	
BUSINESS	35.53	37.24	40.75	45.23	
	20	92	862	115	2
HOME ECONOMICS	0	47	39	42	2
	19	81	224	92	
INDUSTRIAL ARTS	32	31	36.17	38.67	

Table 105.

	Bilingual				Active from
	1973	1977	1981	1985	1985 Oct. Report
ELEMENTARY	30.28	32.56	34.88	38.85	
	486	1412	3020	1484	114
YOUNG CHILDREN	30.5	35.33	34.32	38.31	
WITH SPEC. NEEDS	2	8	29	53	11
EARLY CHILDHOOD	0	0	0	33.43	
	0	4	5	27	
MIDDLE SCHOOL	0	0	0	31.58	
	0	2	4	18	
ENGLISH: 2ND LANGUAGE	31	32	33.43	36.67	
	1	3	4	17	
ENGLISH	28.98	33.36	35.48	39.17	
	202	429	1000	426	6
HISTORY	30.86	34.43	36.79	40.48	
	60	153	409	159	0.4
GEOGRAPHY	32	35.33	39.92	45.21	
	2	7	33	17	
SOCIAL STUDIES	30.04	32.95	36.18	40.64	
	135	336	959	388	4
MATHEMATICS	29.03	31.59	35.6	39.07	
	85	197	526	257	4
CHEMISTRY	35.33	33	35.5	38.11	
	29	43	156	80	
PHYSICS	29.5	34	35.33	39.5	
	9	30	81	36	
BIOLOGY	34.31	35.41	36.64	40.15	
	40	84	308	125	1.8
GENERAL SCIENCE	31.23	33.11	35.11	39.46	
	88	154	547	238	4
EARTH SCIENCE	34.5	37	42	43	
	6	10	67	35	
FRENCH	30.46	31.84	35.8	39.79	
	49	112	267	111	17.2
GERMAN	29.14	31.44	34.22	39.67	
	8	23	42	27	1
SPANISH	30.41	31.83	34.47	38.53	
	50	109	305	154	35.4

Table 104.

Total Minority Graduation
Massachusetts Program Leading Certification

Adjusted Data: 1982 to 1986

	Total Graduates	Total Minority	Black	Hispanic	Other	Percent Minority
1982	3088	412	57	73	282	0.133419
1983	2883	293	65	66	162	0.101630
1984	2675	231	73	36	122	0.086355
1985	2773	234	66	52	117	0.084385
1986	2653	172	46	48	78	0.064832

	Total	Number Hired White	Number Hired Minority	Percent Hired White	Percent Hired Minority
1982	599	555	44	0.926544	0.073455
1983	518	476	42	0.918918	0.081081
1984	453	427	25	0.942604	0.055187
1985	408	378	30	0.926470	0.073529
1986	228	220	8	0.964912	0.035087

Table 103.

TOTAL MINORITY ENROLL./TEACHERS	1982	1984	1985
AMHERST	40	n.a.	n.a.
AYER	137	186	n.a.
BOSTON	23	n.a.	23
BROCKTON	42	70	n.a.
BROOKLINE	35	31	n.a.
CAMBRIDGE	n.a.	30	n.a.
CHELSEA	n.a.	157	n.a.
CLINTON	n.a.	214	n.a.
CONCORD	n.a.	n.a.	n.a.
FITCHBURG	n.a.	113	n.a.
FRAMINGHAM	79	n.a.	n.a.
HOLYOKE	n.a.	143	n.a.
LAWRENCE	n.a.	n.a.	n.a.
LEOMINSTER	96	n.a.	114
LEXINGTON	120	67	n.a.
LINCOLN	n.a.	53	n.a.
LOWELL	324	259	n.a.
LYNN	87	42	n.a.
MASHPEE	n.a.	n.a.	n.a.
NEW BEDFORD	43	n.a.	n.a.
NEWTON	24	n.a.	n.a.
OAK BLUFFS	n.a.	n.a.	n.a.
SALEM	48	n.a.	n.a.
SHIRLEY	n.a.	n.a.	n.a.
SOUTHBRIDGE	386	n.a.	n.a.
SPRINGFIELD	n.a.	72	n.a.
SUNDERLAND	n.a.	n.a.	n.a.
WALTHAM	137	118	n.a.
WAREHAM	n.a.	62	n.a.
WAYLAND	n.a.	n.a.	n.a.
WESTON	n.a.	n.a.	n.a.
WORCESTER	60	51	n.a.

Table 102.

WHITE ENROLL./TEACHERS	1982	1984	1985
AMHERST	6	n.a.	n.a.
AYER	15	16	n.a.
BOSTON	5	n.a.	4
BROCKTON	13	13	n.a.
BROOKLINE	10	9	n.a.
CAMBRIDGE	n.a.	6	n.a.
CHELSEA	n.a.	7	n.a.
CLINTON	n.a.	9	n.a.
CONCORD	n.a.	n.a.	n.a.
FITCHBURG	n.a.	13	n.a.
FRAMINGHAM	13	n.a.	n.a.
HOLYOKE	n.a.	6	n.a.
LAWRENCE	n.a.	n.a.	n.a.
LEOMINSTER	18	n.a.	17
LEXINGTON	12	12	n.a.
LINCOLN	n.a.	7	n.a.
LOWELL	13	13	n.a.
LYNN	15	13	n.a.
MASHPEE	n.a.	n.a.	n.a.
NEW BEDFORD	12	n.a.	n.a.
NEWTON	11	n.a.	n.a.
OAK BLUFFS	n.a.	n.a.	n.a.
SALEM	14	n.a.	n.a.
SHIRLEY	n.a.	10	n.a.
SOUTHBRIDGE	16	n.a.	n.a.
SPRINGFIELD	n.a.	7	n.a.
SUNDERLAND	n.a.	n.a.	n.a.
WALTHAM	12	11	n.a.
WAREHAM	n.a.	12	n.a.
WAYLAND	n.a.	n.a.	n.a.
WESTON	n.a.	n.a.	n.a.
WORCESTER	11	10	n.a.

MASSACHUSETTS SCHOOL SYSTEMS

Minority Enroll./Minority Teachers

1984

N.A.

0 to 49

50 to 149

150 to ...
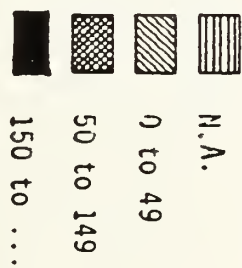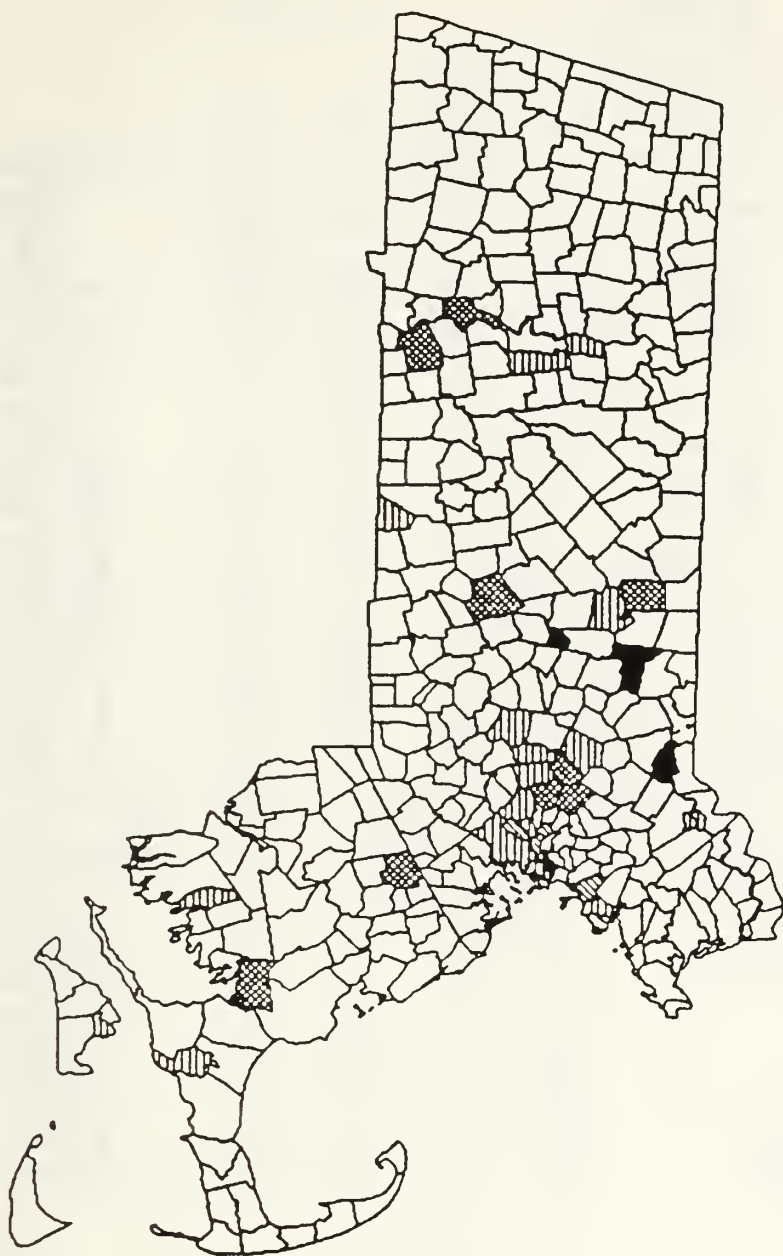
Figure 110.

MASSACHUSETTS SCHOOL SYSTEMS

Minority Enroll./Minority Teachers

1982

N.A.

0 to 49

50 to 149

150 to 400
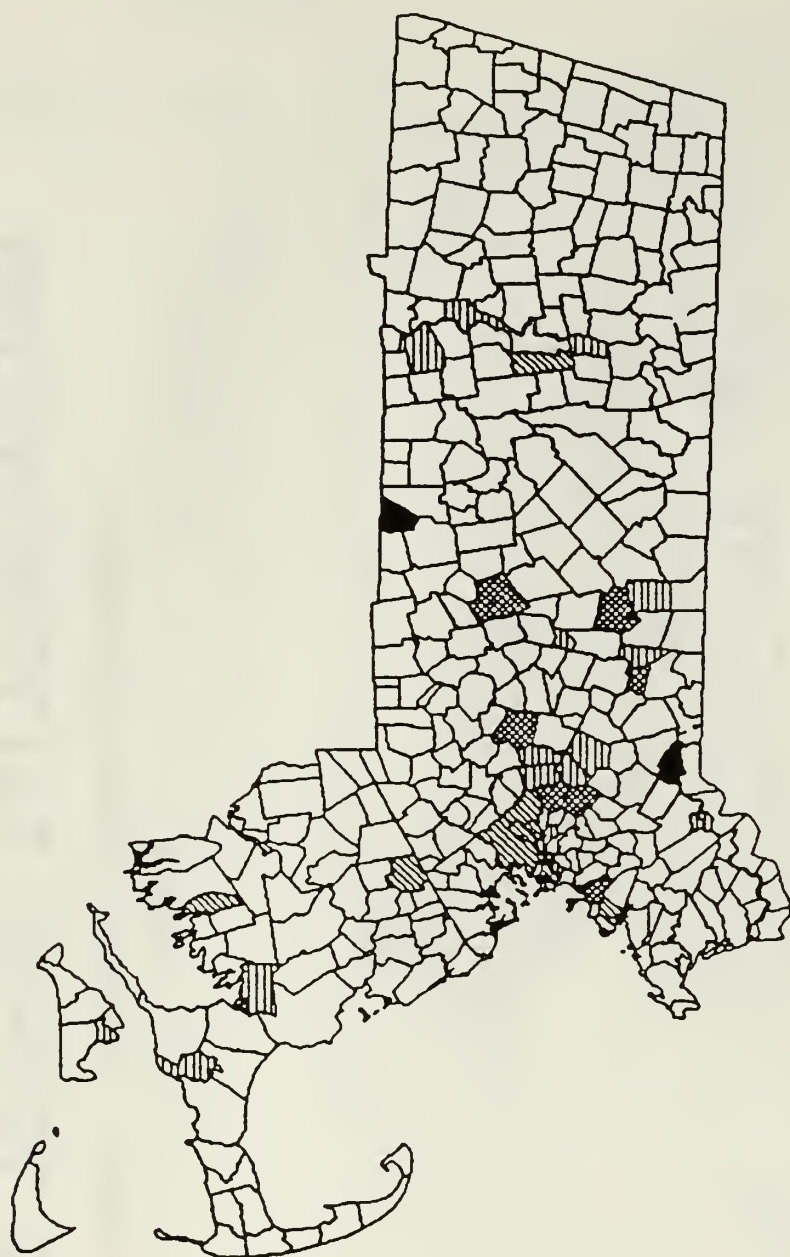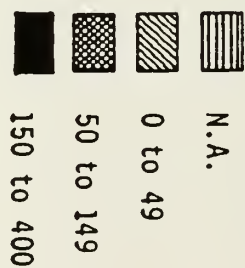
Figure 109.

Table 101.

	1982	1984	1985	1986
HISPANIC/TOTAL				
AMHERST	0.0058	n.a.	n.a.	0.0060
AYER	0.0068	0.0000	n.a.	0.0061
BOSTON	0.0534	n.a.	0.0662	n.a.
BROCKTON	0.0202	0.0084	n.a.	n.a.
BROOKLINE	0.0087	0.0137	n.a.	n.a.
CAMBRIDGE	n.a.	0.0208	n.a.	n.a.
CHELSEA	n.a.	0.0340	n.a.	0.0789
CLINTON	n.a.	0.0000	n.a.	0.0000
CONCORD	n.a.	n.a.	n.a.	0.0090
FITCHBURG	n.a.	0.0137	n.a.	n.a.
FRAMINGHAM	0.0110	n.a.	n.a.	n.a.
HOLYOKE	n.a.	0.0259	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0.0226	n.a.	0.0194	n.a.
LEXINGTON	0.0050	0.0080	n.a.	n.a.
LINCOLN	n.a.	0.0000	n.a.	n.a.
LOWELL	0.0062	0.0013	n.a.	n.a.
LYNN	0.0040	0.0150	n.a.	0.0076
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0.0119	n.a.	n.a.	0.0160
NEWTON	0.0010	n.a.	n.a.	0.0034
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	0.0191	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0.0000	n.a.	0.0000
SOUTHBRIDGE	0.0068	n.a.	n.a.	0.0213
SPRINGFIELD	n.a.	0.0378	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	0.0075	0.0081	n.a.	0.0191
WAREHAM	n.a.	0.0000	n.a.	0.0000
WAYLAND	n.a.	n.a.	n.a.	0.0000
WESTON	n.a.	n.a.	n.a.	0.0068
WORCESTER	0.0240	0.0344	n.a.	n.a.

Table 100.

HISPANIC	1982	1984	1985	1986	1982	1984	1985	1986
AMHERST	1	n.a.	n.a.	1	0	n.a.	n.a.	0
AYER	1	0	n.a.	1	0	0	n.a.	0
BOSTON	307	n.a.	401	n.a.	0	n.a.	27	n.a.
BROCKTON	24	9	n.a.	n.a.	1	1	n.a.	n.a.
BROOKLINE	4	7	n.a.	n.a.	0	1	n.a.	n.a.
CAMBRIDGE	n.a.	17	n.a.	n.a.	n.a.	0	n.a.	n.a.
CHELSEA	n.a.	9	n.a.	21	n.a.	0	n.a.	3
CLINTON	n.a.	0	n.a.	0	n.a.	0	n.a.	0
CONCORD	n.a.	n.a.	n.a.	2	n.a.	n.a.	n.a.	0
FITCHBURG	n.a.	4	n.a.	n.a.	n.a.	0	n.a.	n.a.
FRAMINGHAM	7	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
HOLYOKE	n.a.	15	n.a.	n.a.	n.a.	4	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	6	n.a.	5	n.a.	0	n.a.	0	n.a.
LEXINGTON	2	3	n.a.	n.a.	0	0	n.a.	n.a.
LINCOLN	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
LOWELL	5	1	n.a.	n.a.	0	0	n.a.	n.a.
LYNN	3	12	n.a.	6	0	0	n.a.	0
MASHPEE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	12	n.a.	n.a.	21	1	n.a.	n.a.	2
NEWTON	1	n.a.	n.a.	3	0	n.a.	n.a.	0
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SALEM	6	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0	n.a.	0	n.a.	0	n.a.	0
SOUTHBRIDGE	1	n.a.	n.a.	4	0	n.a.	n.a.	0
SPRINGFIELD	n.a.	63	n.a.	n.a.	n.a.	4	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WALTHAM	4	4	n.a.	10	0	0	n.a.	
WAREHAM	n.a.	0	n.a.	0	n.a.	0	n.a.	0
WAYLAND	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	0
WESTON	n.a.	n.a.	n.a.	1	n.a.	n.a.	n.a.	0
WORCESTER	40	54	n.a.	n.a.	0	5	n.a.	n.a.

Table 99.

	1982	1984	1985	1986
BLACK/TOTAL				
AMHERST	0.0174	n.a.	n.a.	0.0417
AYER	0.0204	0.0227	n.a.	0.0245
BOSTON	0.2322	n.a.	0.2249	n.a.
BROCKTON	0.0261	0.0225	n.a.	n.a.
BROOKLINE	0.0476	0.0586	n.a.	n.a.
CAMBRIDGE	n.a.	0.1088	n.a.	n.a.
CHELSEA	n.a.	0.0038	n.a.	0.0038
CLINTON	n.a.	0.0054	n.a.	0.0000
CONCORD	n.a.	n.a.	n.a.	0.0448
FITCHBURG	n.a.	0.0069	n.a.	n.a.
FRAMINGHAM	0.0110	n.a.	n.a.	n.a.
HOLYOKE	n.a.	0.0086	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0.0000	n.a.	0.0000	n.a.
LEXINGTON	0.0050	0.0134	n.a.	n.a.
LINCOLN	n.a.	0.0331	n.a.	n.a.
LOWELL	0.0025	0.0026	n.a.	n.a.
LYNN	0.0212	0.0413	n.a.	0.0252
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0.0505	n.a.	n.a.	0.0609
NEWTON	0.0553	n.a.	n.a.	0.0570
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	0.0032	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0.0000	n.a.	0.0000
SOUTHBRIDGE	0.0000	n.a.	n.a.	0.0000
SPRINGFIELD	n.a.	0.0653	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	0.0019	0.0040	n.a.	0.0038
WAREHAM	n.a.	0.0335	n.a.	0.0213
WAYLAND	n.a.	n.a.	n.a.	0.0118
WESTON	n.a.	n.a.	n.a.	0.0338
WORCESTER	0.0144	0.0165	n.a.	n.a.

Table 98.

BLACK	1982	1984	1985	1986	1982	1984	1985	1986
AMHERST	3	n.a.	n.a.	7	1	n.a.	n.a.	0
AYER	3	3	n.a.	4	0	0	n.a.	0
BOSTON	1335	n.a.	1362	n.a.	0	n.a.	42	n.a.
BROCKTON	31	24	n.a.	n.a.	1	0	n.a.	n.a.
BROOKLINE	22	30	n.a.	n.a.	1	1	n.a.	n.a.
CAMBRIDGE	n.a.	89	n.a.	n.a.	n.a.	0	n.a.	n.a.
CHELSEA	n.a.	1	n.a.	1	n.a.	0	n.a.	0
CLINTON	n.a.	1	n.a.	0	n.a.	0	n.a.	0
CONCORD	n.a.	n.a.	n.a.	10	n.a.	n.a.	n.a.	1
FITCHBURG	n.a.	2	n.a.	n.a.	n.a.	0	n.a.	n.a.
FRAMINGHAM	7	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
HOLYOKE	n.a.	5	n.a.	n.a.	n.a.	2	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0	n.a.	0	n.a.	0	n.a.		n.a.
LEXINGTON	2	5	n.a.	n.a.	0	1	n.a.	n.a.
LINCOLN	n.a.	4	n.a.	n.a.	n.a.	0	n.a.	n.a.
LOWELL	2	2	n.a.	n.a.	0	1	n.a.	n.a.
LYNN	16	33	n.a.	20	0	0	n.a.	0
MASHPEE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	51	n.a.	n.a.	80	0	n.a.	n.a.	1
NEWTON	53	n.a.	n.a.	51	3	n.a.	n.a.	5
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SALEM	1	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0	n.a.	0	n.a.	0	n.a.	0
SOUTHBRIDGE	0	n.a.	n.a.	0	0	n.a.	n.a.	0
SPRINGFIELD	n.a.	109	n.a.	n.a.	n.a.	2	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WALTHAM	1	2	n.a.	2	1	0	n.a.	
WAREHAM	n.a.	7	n.a.	5	n.a.	0	n.a.	0
WAYLAND	n.a.	n.a.	n.a.	2	n.a.	n.a.	n.a.	1
WESTON	n.a.	n.a.	n.a.	5	n.a.	n.a.	n.a.	0
WORCESTER	24	26	n.a.	n.a.	0	5	n.a.	n.a.

Table 97.

	1982	1984	1985	1986
ASIAN/TOTAL				
AMHERST	0.0116	n.a.	n.a.	0.0000
AYER	0.0000	0.0000	n.a.	0.0000
BOSTON	0.0313	n.a.	0.0279	n.a.
BROCKTON	0.0067	0.0103	n.a.	n.a.
BROOKLINE	0.0303	0.0215	n.a.	n.a.
CAMBRIDGE	n.a.	0.0110	n.a.	n.a.
CHELSEA	n.a.	0.0038	n.a.	0.0338
CLINTON	n.a.	0.0000	n.a.	0.0000
CONCORD	n.a.	n.a.	n.a.	0.0000
FITCHBURG	n.a.	0.0069	n.a.	n.a.
FRAMINGHAM	0.0016	n.a.	n.a.	n.a.
HOLYOKE	n.a.	0.0017	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0.0000	n.a.	0.0000	n.a.
LEXINGTON	0.0000	0.0027	n.a.	n.a.
LINCOLN	n.a.	0.0000	n.a.	n.a.
LOWELL	0.0000	0.0091	n.a.	n.a.
LYNN	0.0013	0.0025	n.a.	0.0063
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0.0000	n.a.	n.a.	0.0000
NEWTON	0.0000	n.a.	n.a.	0.0045
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	0.0032	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0.0000	n.a.	0.0000
SOUTHBRIDGE	0.0000	n.a.	n.a.	0.0000
SPRINGFIELD	n.a.	0.0006	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	0.0000	0.0000	n.a.	0.0038
WAREHAM	n.a.	0.0000	n.a.	0.0000
WAYLAND	n.a.	n.a.	n.a.	0.0000
WESTON	n.a.	n.a.	n.a.	0.0068
WORCESTER	0.0006	0.0025	n.a.	n.a.

Table 96.

ASIAN	1982	1984	1985	1986	1982	1984	1985	1986
AMHERST	2	n.a.	n.a.	0	2	n.a.	n.a.	0
AYER	0	0	n.a.	0	0	0	n.a.	0
BOSTON	180	n.a.	169	n.a.	0	n.a.	6	n.a.
BROCKTON	8	11	n.a.	n.a.	0	0	n.a.	n.a.
BROOKLINE	14	11	n.a.	n.a.	3	0	n.a.	n.a.
CAMBRIDGE	n.a.	9	n.a.	n.a.	n.a.	0	n.a.	n.a.
CHELSEA	n.a.	1	n.a.	9	n.a.	0	n.a.	2
CLINTON	n.a.	0	n.a.	0	n.a.	0	n.a.	0
CONCORD	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	0
FITCHBURG	n.a.	2	n.a.	n.a.	n.a.	0	n.a.	n.a.
FRAMINGHAM	1	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
HOLYOKE	n.a.	1	n.a.	n.a.	n.a.		n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0	n.a.	0	n.a.	0	n.a.	0	n.a.
LEXINGTON	0	1	n.a.	n.a.	0	0	n.a.	n.a.
LINCOLN	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
LOWELL	0	7	n.a.	n.a.	0	0	n.a.	n.a.
LYNN	1	2	n.a.	5	0	0	n.a.	0
MASHPEE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0	n.a.	n.a.	0	0	n.a.	n.a.	0
NEWTON	0	n.a.	n.a.	4	0	n.a.	n.a.	0
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SALEM	1	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0	n.a.	0	n.a.	0	n.a.	0
SOUTHBRIDGE	0	n.a.	n.a.	0	0	n.a.	n.a.	0
SPRINGFIELD	n.a.	1	n.a.	n.a.	n.a.	0	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WALTHAM	0	0	n.a.	2	0	0	n.a.	n.a.
WAREHAM	n.a.	0	n.a.	0	n.a.	0	n.a.	0
WAYLAND	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	0
WESTON	n.a.	n.a.	n.a.	1	n.a.	n.a.	n.a.	0
WORCESTER	1	4	n.a.	n.a.	0	0	n.a.	n.a.

Table 95.

TEACHERS

	1982	1984	1985	1986
AMERICAN INDIAN /TOTAL				
AMHERST	0.0000	n.a.	n.a.	0.0000
AYER	0.0000	0.0000	n.a.	0.0000
BOSTON	0.0037	n.a.	0.0036	n.a.
BROCKTON	0.0017	0.0000	n.a.	n.a.
BROOKLINE	0.0000	0.0000	n.a.	n.a.
CAMBRIDGE	n.a.	0.0000	n.a.	n.a.
CHELSEA	n.a.	0.0000	n.a.	0.0000
CLINTON	n.a.	0.0000	n.a.	0.0000
CONCORD	n.a.	n.a.	n.a.	0.0000
FITCHBURG	n.a.	0.0000	n.a.	n.a.
FRAMINGHAM	0.0000	n.a.	n.a.	n.a.
HOLYOKE	n.a.	0.0000	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0.0000	n.a.	0.0000	n.a.
LEXINGTON	0.0025	0.0027	n.a.	n.a.
LINCOLN	n.a.	0.0000	n.a.	n.a.
LOWELL	0.0000	0.0000	n.a.	n.a.
LYNN	0.0000	0.0000	n.a.	0.0000
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0.0020	n.a.	n.a.	0.0023
NEWTON	0.0000	n.a.	n.a.	0.0000
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	0.0000	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0.0000	n.a.	0.0000
SOUTHBRIDGE	0.0000	n.a.	n.a.	0.0000
SPRINGFIELD	n.a.	0.0000	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	0.0000	0.0000	n.a.	0.0000
WAREHAM	n.a.	0.0000	n.a.	0.0000
WAYLAND	n.a.	n.a.	n.a.	0.0000
WESTON	n.a.	n.a.	n.a.	0.0000
WORCESTER	0.0006	0.0000	n.a.	n.a.

Table 94.

	TEACHERS				NEW HIRES			
	1982	1984	1985	1986	1982	1984	1985	1986
AMERICAN INDIAN								
AMHERST	0	n.a.	n.a.	0	0	n.a.	n.a.	0
AYER	0	0	n.a.	0	0	0	n.a.	0
BOSTON	21	n.a.	22	n.a.	0	n.a.	0	n.a.
BROCKTON	2	0	n.a.	n.a.	0	0	n.a.	n.a.
BROOKLINE	0	0	n.a.	n.a.	0	0	n.a.	n.a.
CAMBRIDGE	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
CHELSEA	n.a.	0	n.a.	0	n.a.	0	n.a.	0
CLINTON	n.a.	0	n.a.	0	n.a.	0	n.a.	0
CONCORD	n.a.		n.a.	0	n.a.		n.a.	0
FITCHBURG	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
FRAMINGHAM	0		n.a.	n.a.	0		n.a.	n.a.
HOLYOKE	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0	n.a.	0	n.a.	0	n.a.	0	n.a.
LEXINGTON	1	1	n.a.	n.a.	0	0	n.a.	n.a.
LINCOLN	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
LOWELL	0	0	n.a.	n.a.	0	0	n.a.	n.a.
LYNN	0	0	n.a.	0	0	0	n.a.	0
MASHPEE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	2	n.a.	n.a.	3	0	n.a.	n.a.	0
NEWTON	0	n.a.	n.a.	0	0	n.a.	n.a.	0
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SALEM	0	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0	n.a.	0	n.a.	0	n.a.	0
SOUTHBRIDGE	0	n.a.	n.a.	0	0	n.a.	n.a.	0
SPRINGFIELD	n.a.	0	n.a.	n.a.	n.a.	0	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WALTHAM	0	0	n.a.	0	0	0	n.a.	
WAREHAM	n.a.	0	n.a.	0	n.a.	0	n.a.	0
WAYLAND	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	0
WESTON	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	0
WORCESTER	1	0	n.a.	n.a.	0	0	n.a.	n.a.

Table 93.

MINORITY/TOTAL	1982	1984	1985	1986
AMHERST	0.035	n.a.	n.a.	0.048
AYER	0.027	0.023	n.a.	0.031
BOSTON	0.321	n.a.	0.323	n.a.
BROCKTON	0.055	0.041	n.a.	n.a.
BROOKLINE	0.087	0.094	n.a.	n.a.
CAMBRIDGE	n.a.	0.141	n.a.	n.a.
CHELSEA	n.a.	0.042	n.a.	0.117
CLINTON	n.a.	0.005	n.a.	0.000
CONCORD	n.a.	n.a.	n.a.	0.054
FITCHBURG	n.a.	0.027	n.a.	n.a.
FRAMINGHAM	0.024	n.a.	n.a.	n.a.
HOLYOKE	n.a.	0.036	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0.023	n.a.	0.019	n.a.
LEXINGTON	0.013	0.027	n.a.	n.a.
LINCOLN	n.a.	0.033	n.a.	n.a.
LOWELL	0.009	0.013	n.a.	n.a.
LYNN	0.026	0.059	n.a.	0.039
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0.064	n.a.	n.a.	0.079
NEWTON	0.056	n.a.	n.a.	0.065
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	0.025	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0.000	n.a.	0.000
SOUTHBRIDGE	0.007	n.a.	n.a.	0.021
SPRINGFIELD	n.a.	0.104	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	0.009	0.012	n.a.	0.027
WAREHAM	n.a.	0.033	n.a.	0.021
WAYLAND	n.a.	n.a.	n.a.	0.012
WESTON	n.a.	n.a.	n.a.	0.047
WORCESTER	0.040	0.053	n.a.	n.a.

Table 92.

TOTAL MINORITY	1982	1984	1985	1986
AMHERST	6	n.a.	n.a.	8
AYER	4	3	n.a.	5
BOSTON	1843	n.a.	1954	n.a.
BROCKTON	65	44	n.a.	n.a.
BROOKLINE	40	48	n.a.	n.a.
CAMBRIDGE	n.a.	115	n.a.	n.a.
CHELSEA	n.a.	11	n.a.	31
CLINTON	n.a.	1	n.a.	0
CONCORD	n.a.	n.a.	n.a.	12
FITCHBURG	n.a.	8	n.a.	n.a.
FRAMINGHAM	15	n.a.	n.a.	n.a.
HOLYOKE	n.a.	21	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	6	n.a.	5	n.a.
LEXINGTON	5	10	n.a.	n.a.
LINCOLN	n.a.	4	n.a.	n.a.
LOWELL	7	10	n.a.	n.a.
LYNN	20	47	n.a.	31
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	65	n.a.	n.a.	104
NEWTON	54	n.a.	n.a.	58
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	8	n.a.	n.a.	n.a.
SHIRLEY	n.a.	0	n.a.	0
SOUTHBRIDGE	1	n.a.	n.a.	4
SPRINGFIELD	n.a.	173	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	5	6	n.a.	14
WAREHAM	n.a.	7	n.a.	5
WAYLAND	n.a.	n.a.	n.a.	2
WESTON	n.a.	n.a.	n.a.	7
WORCESTER	66	84	n.a.	n.a.

Table 91.

	1982	1984	1985	1986
WHITE/TOTAL				
AMHERST	0.9651	n.a.	n.a.	0.9524
AYER	0.9728	0.9773	n.a.	0.9693
BOSTON	0.6794	n.a.	0.6773	n.a.
BROCKTON	0.9452	0.9587	n.a.	n.a.
BROOKLINE	0.9134	0.9063	n.a.	n.a.
CAMBRIDGE	n.a.	0.8594	n.a.	n.a.
CHELSEA	n.a.	0.9585	n.a.	0.8835
CLINTON	n.a.	0.9946	n.a.	1.0000
CONCORD	n.a.	n.a.	n.a.	0.9462
FITCHBURG	n.a.	0.9725	n.a.	n.a.
FRAMINGHAM	0.9765	n.a.	n.a.	n.a.
HOLYOKE	n.a.	0.9637	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	0.9774	n.a.	0.9806	n.a.
LEXINGTON	0.9875	0.9732	n.a.	n.a.
LINCOLN	n.a.	0.9669	n.a.	n.a.
LOWELL	0.9914	0.9870	n.a.	n.a.
LYNN	0.9735	0.9413	n.a.	0.9610
MASHPEE	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	0.9356	n.a.	n.a.	0.9208
NEWTON	0.9437	n.a.	n.a.	0.9352
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.
SALEM	0.9745	n.a.	n.a.	n.a.
SHIRLEY	n.a.	1.0000	n.a.	1.0000
SOUTHBRIDGE	0.9932	n.a.	n.a.	0.9787
SPRINGFIELD	n.a.	0.8963	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.
WALTHAM	0.9906	0.9879	n.a.	0.9733
WAREHAM	n.a.	0.9665	n.a.	0.9787
WAYLAND	n.a.	n.a.	n.a.	0.9882
WESTON	n.a.	n.a.	n.a.	0.9527
WORCESTER	0.9605	0.9466	n.a.	n.a.

Table 90.

WHITE	1982	1984	1985	1986	1982	1984	1985	1986
AMHERST	166	n.a.	n.a.	160	8	n.a.	n.a.	0
AYER	143	129	n.a.	158	0	7	n.a.	0
BOSTON	3906	n.a.	4102	n.a.	0	n.a.	73	n.a.
BROCKTON	1122	1022	n.a.	n.a.	9	32	n.a.	n.a.
BROOKLINE	422	464	n.a.	n.a.	6	32	n.a.	n.a.
CAMBRIDGE	n.a.	703	n.a.	n.a.	n.a.	0	n.a.	n.a.
CHELSEA	n.a.	254	n.a.	235	n.a.	11	n.a.	14
CLINTON	n.a.	184	n.a.	112	n.a.	6	n.a.	0
CONCORD	n.a.	n.a.	n.a.	211	n.a.	n.a.	n.a.	11
FITCHBURG	n.a.	283	n.a.	n.a.	n.a.	0	n.a.	n.a.
FRAMINGHAM	622	n.a.	n.a.	n.a.	75	n.a.	n.a.	n.a.
HOLYOKE	n.a.	558	n.a.	n.a.	n.a.	10	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	260	n.a.	253	n.a.	2	n.a.	6	n.a.
LEXINGTON	395	363	n.a.	n.a.	13	23	n.a.	n.a.
LINCOLN	n.a.	117	n.a.	n.a.	n.a.	6	n.a.	n.a.
LOWELL	805	762	n.a.	n.a.	0	31	n.a.	n.a.
LYNN	735	753	n.a.	763	1	4	n.a.	8
MASHPEE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	944	n.a.	n.a.	1209	6	n.a.	n.a.	55
NEWTON	905	n.a.	n.a.	837	26	n.a.	n.a.	50
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SALEM	306	n.a.	n.a.	n.a.	1	n.a.	n.a.	n.a.
SHIRLEY	n.a.	43	n.a.	41	n.a.	0	n.a.	2
SOUTHBRIDGE	145	n.a.	n.a.	184	3	n.a.	n.a.	8
SPRINGFIELD	n.a.	1495	n.a.	n.a.	n.a.	14	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WALTHAM	529	489	n.a.	510	15	5	n.a.	
WAREHAM	n.a.	202	n.a.	230	n.a.	5	n.a.	10
WAYLAND	n.a.	n.a.	n.a.	167	n.a.	n.a.	n.a.	16
WESTON	n.a.	n.a.	n.a.	141	n.a.	n.a.	n.a.	9
WORCESTER	1604	1488	n.a.	n.a.	0	28	n.a.	n.a.

Table 89.

TOTAL	1982	1984	1985	1986	1982	1984	1985	1986
AMHERST	172	n.a.	n.a.	168	11	n.a.	n.a.	0
AYER	147	132	n.a.	163	0	7	n.a.	0
BOSTON	5749	n.a.	6056	n.a.	0	n.a.	148	n.a.
BROCKTON	1187	1066	n.a.	n.a.	11	33	n.a.	n.a.
BROOKLINE	462	512	n.a.	n.a.	10	34	n.a.	n.a.
CAMBRIDGE	n.a.	818	n.a.	n.a.	n.a.	0	n.a.	n.a.
CHELSEA	n.a.	265	n.a.	266	n.a.	11	n.a.	19
CLINTON	n.a.	185	n.a.	112	n.a.	6	n.a.	0
CONCORD	n.a.	n.a.	n.a.	223	n.a.	n.a.	n.a.	12
FITCHBURG	n.a.	291	n.a.	n.a.	n.a.	0	n.a.	n.a.
FRAMINGHAM	637	n.a.	n.a.	n.a.	75	n.a.	n.a.	n.a.
HOLYOKE	n.a.	579	n.a.	n.a.	n.a.	16	n.a.	n.a.
LAWRENCE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LEOMINSTER	266	n.a.	258	n.a.	2	n.a.	6	n.a.
LEXINGTON	400	373	n.a.	n.a.	13	24	n.a.	n.a.
LINCOLN	n.a.	121	n.a.	n.a.	n.a.	6	n.a.	n.a.
LOWELL	812	772	n.a.	n.a.	0	32	n.a.	n.a.
LYNN	755	800	n.a.	794	1	4	n.a.	8
MASHPEE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NEW BEDFORD	1009	n.a.	n.a.	1313	7	n.a.	n.a.	58
NEWTON	959	n.a.	n.a.	895	29	n.a.	n.a.	55
OAK BLUFFS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SALEM	314	n.a.	n.a.	n.a.	1	n.a.	n.a.	n.a.
SHIRLEY	n.a.	43	n.a.	41	n.a.	0	n.a.	2
SOUTHBRIDGE	146	n.a.	n.a.	188	3	n.a.	n.a.	8
SPRINGFIELD	n.a.	1668	n.a.	n.a.	n.a.	20	n.a.	n.a.
SUNDERLAND	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WALTHAM	534	495	n.a.	524	16	5	n.a.	ERR
WAREHAM	n.a.	209	n.a.	235	n.a.	5	n.a.	10
WAYLAND	n.a.	n.a.	n.a.	169	n.a.	n.a.	n.a.	17
WESTON	n.a.	n.a.	n.a.	148	n.a.	n.a.	n.a.	9
WORCESTER	1670	1572	n.a.	n.a.	0	38	n.a.	n.a.

MASSACHUSETTS SCHOOL SYSTEMS

Minority Enrollment Larger Than 10%
Change between 1979 and 1985

decrease
increase <5 % points
increase >5 % points
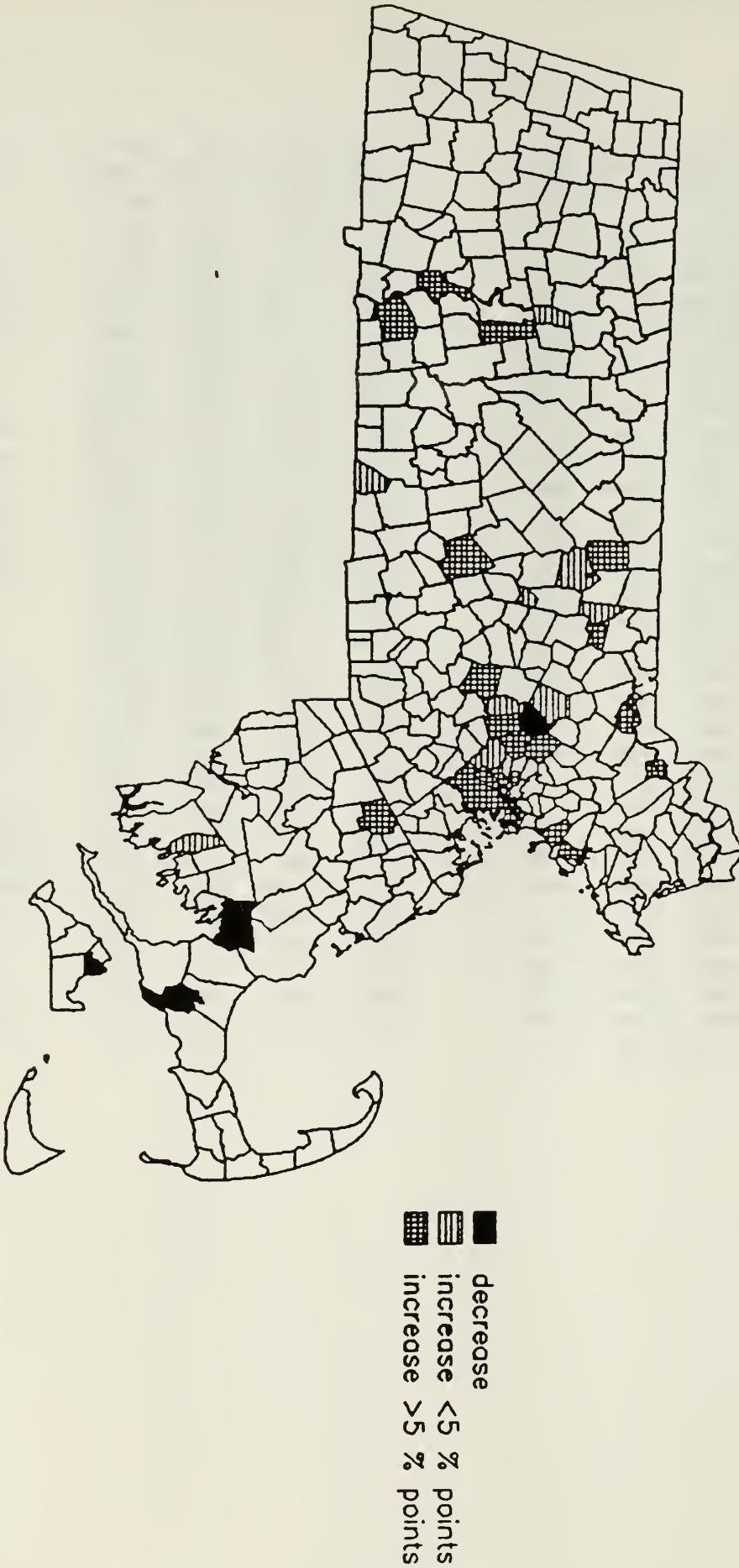
Figure 108.

Table 88.

	(85-79)
AMHERST	0.091
AYER	0.065
BOSTON	0.102
BROCKTON	0.093
BROOKLINE	0.074
CAMBRIDGE	0.121
CHELSEA	0.241
CLINTON	0.008
CONCORD	0.027
FITCHBURG	0.117
FRAMINGHAM	0.059
HOLYOKE	0.196
LAWRENCE	0.206
LEOMINSTER	0.036
LEXINGTON	0.053
LINCOLN	-0.002
LOWELL	0.122
LYNN	0.076
MASHPEE	-0.053
NEW BEDFORD	0.018
NEWTON	0.034
OAK BLUFFS	-0.051
SALEM	0.087
SHIRLEY	0.010
SOUTHBRIDGE	0.050
SPRINGFIELD	0.094
SUNDERLAND	0.035
WALTHAM	0.068
WAREHAM	-0.001
WAYLAND	0.037
WESTON	0.058
WORCESTER	0.093

Table 87.

	1979	1980	1981	1982	1983	1984	1985
WHITE							
AMHERST	0.8382	0.8280	0.8112	0.8124	0.7820	0.7785	0.7474
AYER	0.8270	0.8218	0.8182	0.8011	0.7870	0.7849	0.7616
BOSTON	0.3768	0.3541	0.3301	0.3050	0.2853	0.2806	0.2747
BROCKTON	0.8811	0.8641	0.8576	0.8429	0.8348	0.8102	0.7877
BROOKLINE	0.7871	0.7748	0.7554	0.7483	0.7481	0.7391	0.7128
CAMBRIDGE	0.6619	0.6506	0.6322	0.6049	0.5808	0.5643	0.5414
CHELSEA	0.6992	0.6443	0.6269	0.5670	0.5388	0.4895	0.4584
CLINTON	0.9044	0.9050	0.8956	0.9021	0.9023	0.8883	0.8967
CONCORD	0.9225	0.9153	0.9053	0.8990	0.8956	0.8963	0.8955
FITCHBURG	0.9047	0.8839	0.8778	0.8476	0.8432	0.7991	0.7873
FRAMINGHAM	0.8982	0.8924	0.8894	0.8715	0.8642	0.8519	0.8394
HOLYOKE	0.7023	0.6594	0.6226	0.6601	0.5841	0.5427	0.5062
LAWRENCE	0.6382	0.6011	0.5645	0.5389	0.5140	0.4718	0.4323
LEOMINSTER	0.9181	0.9177	0.9027	0.8913	0.8845	0.8826	0.8818
LEXINGTON	0.9025	0.9028	0.8995	0.8882	0.8774	0.8649	0.8496
LINCOLN	0.7912	0.8037	0.7933	0.7955	0.7955	0.7925	0.7937
LOWELL	0.8690	0.8587	0.8370	0.8172	0.8067	0.7886	0.7473
LYNN	0.8833	0.8778	0.8685	0.8608	0.8475	0.8272	0.8074
MASHPEE	0.7566	0.7500	0.7706	0.7851	0.7948	0.7921	0.8099
NEW BEDFORD	0.8168	0.8143	0.8142	0.8076	0.7982	0.7987	0.7983
NEWTON	0.9067	0.8949	0.8786	0.8803	0.8867	0.8776	0.8727
OAK BLUFFS	0.8447	0.8365	0.8299	0.8204	0.8384	0.8794	0.8955
SALEM	0.9407	0.9300	0.9240	0.9176	0.8955	0.8885	0.8542
SHIRLEY	0.8929	0.8985	0.8956	0.8801	0.8844	0.9014	0.8831
SOUTHBRIDGE	0.8945	0.8889	0.8794	0.8599	0.8682	0.8642	0.8448
SPRINGFIELD	0.5400	0.5070	0.4972	0.4748	0.4592	0.4534	0.4456
SUNDERLAND	0.9789	0.9429	0.9424	0.8592	0.8742	0.8810	0.9434
WALTHAM	0.9362	0.9288	0.9204	0.9022	0.8921	0.8866	0.8679
WAREHAM	0.8638	0.8326	0.8275	0.8328	0.8650	0.8524	0.8651
WAYLAND	0.9280	0.9254	0.9150	0.9140	0.9083	0.8978	0.8912
WESTON	0.8842	0.8665	0.8606	0.8574	0.8406	0.8352	0.8260
WORCESTER	0.8573	0.8488	0.8302	0.8108	0.7984	0.7825	0.7642

Table 86.

	1979	1980	1981	1982	1983	1984	1985
WHITE							
AMHERST	1321	1252	1126	1039	940	935	926
AYER	2510	2402	2197	2211	2084	2032	1910
BOSTON	26368	24071	20792	18592	16921	16830	16674
BROCKTON	16853	16131	15376	14652	13940	13096	12290
BROOKLINE	4916	4732	4405	4198	4236	4204	4078
CAMBRIDGE	6103	5704	5232	4893	4596	4451	4221
CHELSEA	2511	2346	2161	1979	1783	1654	1580
CLINTON	2082	2000	1913	1862	1754	1702	1667
CONCORD	2011	1870	1683	1593	1510	1460	1379
FITCHBURG	4709	4437	4230	4059	3845	3583	3424
FRAMINGHAM	10133	9421	8802	8075	7552	7074	6756
HOLYOKE	5484	5043	4396	4072	3921	3570	3481
LAWRENCE	5234	4844	4627	4555	4410	4123	4045
LEOMINSTER	5676	5465	5103	4729	4558	4322	4238
LEXINGTON	5868	5491	5122	4785	4544	4283	4004
LINCOLN	917	909	879	848	840	806	781
LOWELL	11147	10912	10401	10150	9869	9670	9223
LYNN	12290	11804	11281	10790	10158	9493	8969
MASHPEE	345	360	383	369	399	400	456
NEW BEDFORD	12383	12153	12006	11681	11337	11288	11398
NEWTON	11833	11120	10222	9593	9231	8823	8465
OAK BLUFFS	185	174	161	169	166	175	180
SALEM	5255	4956	4204	4232	3925	3707	3467
SHIRLEY	492	487	489	470	459	448	423
SOUTHBRIDGE	2637	2559	2450	2369	2359	2298	2199
SPRINGFIELD	13431	12478	11699	10961	10402	10324	10110
SUNDERLAND	139	132	131	122	139	148	150
WALTHAM	7933	7388	6844	6303	5887	5533	5178
WAREHAM	3107	2830	2696	2635	2620	2506	2475
WAYLAND	2616	2405	2314	2199	2110	1986	1957
WESTON	2015	1902	1772	1653	1571	1500	1434
WORCESTER	20450	19616	18268	17037	16297	15498	15102

Table 85.

HISPANIC WHITE	1979	1980	1981	1982	1983	1984	1985
AMHERST	0.0324	0.0278	0.0353	0.0446	0.0499	0.0508	0.0549
AYER	0.0241	0.0253	0.0298	0.0308	0.0276	0.0336	0.0598
BOSTON	0.0983	0.1043	0.1095	0.1167	0.1242	0.1296	0.1324
BROCKTON	0.0180	0.0259	0.0252	0.0277	0.0288	0.0324	0.0369
BROOKLINE	0.0200	0.0255	0.0360	0.0355	0.0297	0.0302	0.0379
CAMBRIDGE	0.0589	0.0618	0.0650	0.0784	0.0802	0.0846	0.0903
CHELSEA	0.2061	0.2546	0.2530	0.2963	0.2992	0.3161	0.3351
CLINTON	0.0586	0.0620	0.0740	0.0494	0.0499	0.0632	0.0511
CONCORD	0.0101	0.0088	0.0059	0.0062	0.0065	0.0025	0.0039
FITCHBURG	0.0440	0.0536	0.0510	0.0704	0.0596	0.0854	0.0786
FRAMINGHAM	0.0394	0.0420	0.0427	0.0486	0.0545	0.0579	0.0642
HOLYOKE	0.1667	0.2265	0.2180	0.1870	0.2050	0.3021	0.3122
LAWRENCE	0.2251	0.2477	0.2973	0.3045	0.3317	0.3727	0.3759
LEOMINSTER	0.0489	0.0487	0.0566	0.0609	0.0780	0.0815	0.0780
LEXINGTON	0.0071	0.0077	0.0061	0.0063	0.0068	0.0073	0.0076
LINCOLN	0.0319	0.0186	0.0171	0.0150	0.0180	0.0167	0.0173
LOWELL	0.0707	0.0729	0.0780	0.0976	0.0911	0.1025	0.1073
LYNN	0.0164	0.0189	0.0267	0.0253	0.0210	0.0357	0.0295
MASHPEE	0.0044	0.0000	0.0000	0.0000	0.0020	0.0000	0.0000
NEW BEDFORD	0.0387	0.0374	0.0403	0.0400	0.0453	0.0521	0.0462
NEWTON	0.0102	0.0122	0.0127	0.0138	0.0086	0.0115	0.0103
OAK BLUFFS	0.0411	0.0337	0.0361	0.0049	0.0051	0.0101	0.0050
SALEM	0.0267	0.0300	0.0167	0.0306	0.0381	0.0391	0.0473
SHIRLEY	0.0127	0.0092	0.0000	0.0262	0.0212	0.0161	0.0230
SOUTHBRIDGE	0.0685	0.0667	0.1098	0.1263	0.1152	0.1188	0.0703
SPRINGFIELD	0.1590	0.1895	0.1980	0.1985	0.2198	0.2296	0.2245
SUNDERLAND	0.0000	0.0000	0.0144	0.0423	0.0440	0.0238	0.0000
WALTHAM	0.0375	0.0404	0.0481	0.0594	0.0620	0.0559	0.0665
WAREHAM	0.0111	0.0141	0.0114	0.0044	0.0046	0.0065	0.0091
WAYLAND	0.0050	0.0019	0.0043	0.0050	0.0052	0.0072	0.0087
WESTON	0.0018	0.0050	0.0049	0.0047	0.0080	0.0084	0.0086
WORCESTER	0.0628	0.0711	0.0694	0.0808	0.0840	0.0916	0.0981

Table 84.

HISPANIC WHITE	1979	1980	1981	1982	1983	1984	1985
AMHERST	51	42	49	57	60	61	68
AYER	73	74	80	85	73	87	150
BOSTON	6875	7090	6895	7115	7367	7777	8036
BROCKTON	344	483	452	481	481	523	576
BROOKLINE	125	156	210	199	168	172	217
CAMBRIDGE	543	542	538	634	635	667	704
CHELSEA	740	927	872	1034	990	1068	1155
CLINTON	135	137	158	102	97	121	95
CONCORD	22	18	11	11	11	4	6
FITCHBURG	229	269	246	357	272	383	342
FRAMINGHAM	444	443	423	450	476	481	517
HOLYOKE	1302	1732	1539	1269	1376	1987	2147
LAWRENCE	1846	1996	2437	2574	2846	3257	3518
LEOMINSTER	302	290	320	323	402	399	375
LEXINGTON	46	47	35	34	35	36	36
LINCOLN	37	21	19	16	19	17	17
LOWELL	907	927	969	1212	1115	1257	1324
LYNN	228	254	347	317	252	410	328
MASHPEE	2	0	0	0	1	0	0
NEW BEDFORD	587	558	594	578	643	737	659
NEWTON	133	151	148	150	90	116	100
OAK BLUFFS	9	7	7	1	1	2	1
SALEM	149	160	76	141	167	163	192
SHIRLEY	7	5	0	14	11	8	11
SOUTHBRIDGE	202	192	306	348	313	316	183
SPRINGFIELD	3954	4664	4658	4582	4978	5228	5093
SUNDERLAND	0	0	2	6	7	4	0
WALTHAM	318	321	358	415	409	349	397
WAREHAM	40	48	37	14	14	19	26
WAYLAND	14	5	11	12	12	16	19
WESTON	4	11	10	9	15	15	15
WORCESTER	1497	1643	1527	1698	1714	1815	1938

Table 83.

	1979	1980	1981	1982	1983	1984	1985
HISPANIC NON WHITE							
AMHERST	0.0076	0.0099	0.0130	0.0156	0.0125	0.0125	0.0202
AYER	0.0072	0.0089	0.0086	0.0101	0.0200	0.0124	0.0116
BOSTON	0.0290	0.0309	0.0323	0.0345	0.0369	0.0391	0.0396
BROCKTON	0.0100	0.0135	0.0157	0.0197	0.0190	0.0233	0.0304
BROOKLINE	0.0034	0.0049	0.0050	0.0059	0.0085	0.0077	0.0051
CAMBRIDGE	0.0182	0.0137	0.0172	0.0180	0.0197	0.0174	0.0199
CHELSEA	0.0526	0.0547	0.0719	0.0659	0.0786	0.0772	0.0702
CLINTON	0.0204	0.0163	0.0173	0.0305	0.0309	0.0313	0.0366
CONCORD	0.0023	0.0024	0.0038	0.0023	0.0030	0.0031	0.0013
FITCHBURG	0.0119	0.0100	0.0189	0.0230	0.0287	0.0390	0.0469
FRAMINGHAM	0.0116	0.0103	0.0096	0.0131	0.0126	0.0177	0.0199
HOLYOKE	0.0829	0.0692	0.1095	0.1636	0.1651	0.1064	0.1296
LAWRENCE	0.1025	0.1095	0.0945	0.1108	0.1068	0.0984	0.1344
LEOMINSTER	0.0071	0.0055	0.0058	0.0083	0.0050	0.0039	0.0106
LEXINGTON	0.0023	0.0002	0.0000	0.0000	0.0000	0.0000	0.0008
LINCOLN	0.0026	0.0053	0.0018	0.0019	0.0028	0.0039	0.0020
LOWELL	0.0288	0.0305	0.0369	0.0296	0.0345	0.0259	0.0313
LYNN	0.0225	0.0250	0.0218	0.0308	0.0438	0.0402	0.0475
MASHPEE	0.0066	0.0021	0.0020	0.0000	0.0020	0.0000	0.0000
NEW BEDFORD	0.0200	0.0243	0.0228	0.0265	0.0298	0.0252	0.0297
NEWTON	0.0019	0.0019	0.0138	0.0032	0.0044	0.0039	0.0032
OAK BLUFFS	0.0000	0.0096	0.0000	0.0194	0.0101	0.0000	0.0000
SALEM	0.0150	0.0156	0.0319	0.0219	0.0356	0.0395	0.0628
SHIRLEY	0.0036	0.0018	0.0256	0.0037	0.0039	0.0040	0.0000
SOUTHBRIDGE	0.0326	0.0347	0.0000	0.0004	0.0040	0.0004	0.0722
SPRINGFIELD	0.0209	0.0130	0.0119	0.0291	0.0222	0.0251	0.0344
SUNDERLAND	0.0000	0.0071	0.0072	0.0070	0.0000	0.0119	0.0126
WALTHAM	0.0078	0.0083	0.0050	0.0037	0.0065	0.0083	0.0101
WAREHAM	0.0056	0.0044	0.0052	0.0022	0.0043	0.0037	0.0035
WAYLAND	0.0000	0.0015	0.0016	0.0021	0.0013	0.0005	0.0000
WESTON	0.0004	0.0023	0.0015	0.0026	0.0016	0.0033	0.0023
WORCESTER	0.0210	0.0195	0.0299	0.0291	0.0320	0.0379	0.0431

Table 82.

HISPANIC NON WHITE	1979	1980	1981	1982	1983	1984	1985
AMHERST	12	15	18	20	15	15	25
AYER	22	26	23	28	53	32	29
BOSTON	2028	2103	2035	2104	2190	2345	2402
BROCKTON	192	252	281	343	317	376	475
BROOKLINE	21	30	29	33	48	44	29
CAMBRIDGE	168	120	142	146	156	137	155
CHELSEA	189	199	248	230	260	261	242
CLINTON	47	36	37	63	60	60	68
CONCORD	5	5	7	4	5	5	2
FITCHBURG	62	50	91	110	131	175	204
FRAMINGHAM	131	109	95	121	110	147	160
HOLYOKE	647	529	773	1110	1108	700	891
LAWRENCE	841	882	775	937	916	860	1258
LEOMINSTER	44	33	33	44	26	19	51
LEXINGTON	15	1	0	0	0	0	4
LINCOLN	3	6	2	2	3	4	2
LOWELL	369	387	458	368	422	317	386
LYNN	313	336	283	386	525	461	528
MASHPEE	3	1	1	0	1	0	0
NEW BEDFORD	303	362	336	384	423	356	424
NEWTON	25	24	160	35	46	39	31
OAK BLUFFS	0	2	0	4	2	0	0
SALEM	84	83	145	101	156	165	255
SHIRLEY	2	1	14	2	2	2	0
SOUTHBRIDGE	96	100	0	1	11	1	188
SPRINGFIELD	521	319	279	671	503	571	781
SUNDERLAND	0	1	1	1	0	2	2
WALTHAM	66	66	37	26	43	52	60
WAREHAM	20	15	17	7	13	11	10
WAYLAND	0	4	4	5	3	1	0
WESTON	1	5	3	5	3	6	4
WORCESTER	501	451	658	612	654	750	851

Table 81.

	1979	1980	1981	1982	1983	1984	1985
BLACK							
AMHERST	0.0907	0.0866	0.0944	0.0805	0.0965	0.1024	0.1049
AYER	0.1002	0.1020	0.0968	0.1120	0.1193	0.1236	0.1144
BOSTON	0.4523	0.4574	0.4669	0.4764	0.4810	0.4738	0.4711
BROCKTON	0.0819	0.0827	0.0863	0.0926	0.0990	0.1134	0.1227
BROOKLINE	0.0911	0.0884	0.0966	0.1016	0.1063	0.1083	0.1148
CAMBRIDGE	0.2346	0.2410	0.2513	0.2573	0.2742	0.2833	0.2909
CHELSEA	0.0306	0.0349	0.0322	0.0361	0.0360	0.0373	0.0371
CLINTON	0.0096	0.0090	0.0070	0.0078	0.0062	0.0052	0.0065
CONCORD	0.0505	0.0538	0.0597	0.0655	0.0676	0.0669	0.0701
FITCHBURG	0.0329	0.0398	0.0396	0.0424	0.0469	0.0513	0.0540
FRAMINGHAM	0.0371	0.0392	0.0408	0.0461	0.0462	0.0499	0.0492
HOLYOKE	0.0423	0.0405	0.0445	0.0436	0.0408	0.0420	0.0426
LAWRENCE	0.0265	0.0277	0.0264	0.0266	0.0280	0.0316	0.0300
LEOMINSTER	0.0189	0.0193	0.0218	0.0213	0.0180	0.0157	0.0158
LEXINGTON	0.0532	0.0549	0.0558	0.0594	0.0633	0.0632	0.0675
LINCOLN	0.0906	0.1379	0.1146	0.1463	0.1042	0.1357	0.1423
LOWELL	0.0263	0.0261	0.0266	0.0263	0.0259	0.0250	0.0254
LYNN	0.0735	0.0739	0.0744	0.0719	0.0731	0.0795	0.0893
MASHPEE	0.0833	0.0667	0.0624	0.0766	0.0657	0.0772	0.0782
NEW BEDFORD	0.1230	0.1209	0.1204	0.1235	0.1239	0.1201	0.1220
NEWTON	0.0533	0.0561	0.0555	0.0580	0.0580	0.0611	0.0609
OAK BLUFFS	0.0868	0.1058	0.1082	0.1359	0.1061	0.0854	0.0796
SALEM	0.0116	0.0144	0.0141	0.0176	0.0185	0.0216	0.0234
SHIRLEY	0.0635	0.0664	0.0440	0.0393	0.0443	0.0503	0.0564
SOUTHBRIDGE	0.0010	0.0007	0.0011	0.0004	0.0004	0.0000	0.0000
SPRINGFIELD	0.2772	0.2867	0.2886	0.2914	0.2926	0.2839	0.2871
SUNDERLAND	0.0141	0.0357	0.0216	0.0493	0.0692	0.0536	0.0314
WALTHAM	0.0107	0.0114	0.0136	0.0159	0.0165	0.0229	0.0245
WAREHAM	0.1126	0.1424	0.1504	0.1552	0.1222	0.1313	0.1178
WAYLAND	0.0504	0.0504	0.0550	0.0565	0.0577	0.0615	0.0615
WESTON	0.0856	0.0938	0.0957	0.0928	0.1017	0.1041	0.1089
WORCESTER	0.0500	0.0487	0.0540	0.0602	0.0634	0.0640	0.0687

Table 80.

	1979	1980	1981	1982	1983	1984	1985
BLACK							
AMHERST	143	131	131	103	116	123	130
AYER	304	298	260	309	316	320	287
BOSTON	31651	31092	29411	29039	28524	28419	28599
BROCKTON	1567	1543	1547	1610	1653	1833	1914
BROOKLINE	569	540	563	570	602	616	657
CAMBRIDGE	2163	2113	2080	2081	2170	2235	2268
CHELSEA	110	127	111	126	119	126	128
CLINTON	22	20	15	16	12	10	12
CONCORD	110	110	111	116	114	109	108
FITCHBURG	171	200	191	203	214	230	235
FRAMINGHAM	418	414	404	427	404	414	396
HOLYOKE	330	310	314	296	274	276	293
LAWRENCE	217	223	216	225	240	276	281
LEOMINSTER	117	115	123	113	93	77	76
LEXINGTON	346	334	318	320	328	313	318
LINCOLN	105	156	127	156	110	138	140
LOWELL	338	332	331	327	317	306	313
LYNN	1023	994	966	901	876	912	992
MASHPEE	38	32	31	36	33	39	44
NEW BEDFORD	1864	1805	1775	1787	1760	1697	1742
NEWTON	695	697	646	632	604	614	591
OAK BLUFFS	19	22	21	28	21	17	16
SALEM	65	77	64	81	81	90	95
SHIRLEY	35	36	24	21	23	25	27
SOUTHBRIDGE	3	2	3	1	1	0	0
SPRINGFIELD	6895	7056	6792	6727	6629	6463	6513
SUNDERLAND	2	5	3	7	11	9	5
WALTHAM	91	91	101	111	109	143	146
WAREHAM	405	484	490	491	370	386	337
WAYLAND	142	131	139	136	134	136	135
WESTON	195	206	197	179	190	187	189
WORCESTER	1193	1125	1189	1265	1295	1267	1357

Table 79.

ASIAN	1979	1980	1981	1982	1983	1984	1985
AMHERST	0.0305	0.0463	0.0461	0.0461	0.0591	0.0558	0.0686
AYER	0.0402	0.0407	0.0439	0.0438	0.0446	0.0444	0.0522
BOSTON	0.0386	0.0489	0.0568	0.0630	0.0678	0.0718	0.0777
BROCKTON	0.0061	0.0107	0.0129	0.0148	0.0157	0.0170	0.0193
BROOKLINE	0.0980	0.1058	0.1062	0.1071	0.1060	0.1134	0.1274
CAMBRIDGE	0.0247	0.0308	0.0331	0.0403	0.0437	0.0493	0.0564
CHELSEA	0.0095	0.0107	0.0151	0.0327	0.0456	0.0790	0.0963
CLINTON	0.0070	0.0072	0.0061	0.0102	0.0103	0.0115	0.0086
CONCORD	0.0124	0.0162	0.0221	0.0243	0.0249	0.0295	0.0273
FITCHBURG	0.0050	0.0116	0.0120	0.0161	0.0213	0.0250	0.0331
FRAMINGHAM	0.0134	0.0158	0.0172	0.0203	0.0221	0.0222	0.0271
HOLYOKE	0.0051	0.0043	0.0047	0.0053	0.0049	0.0061	0.0090
LAWRENCE	0.0070	0.0133	0.0161	0.0183	0.0185	0.0243	0.0268
LEOMINSTER	0.0057	0.0079	0.0131	0.0175	0.0136	0.0155	0.0135
LEXINGTON	0.0343	0.0334	0.0381	0.0459	0.0523	0.0644	0.0743
LINCOLN	0.0267	0.0345	0.0343	0.0413	0.0398	0.0492	0.0447
LOWELL	0.0051	0.0109	0.0212	0.0278	0.0406	0.0573	0.0880
LYNN	0.0030	0.0036	0.0075	0.0106	0.0135	0.0162	0.0256
MASHPEE	0.0066	0.0021	0.0020	0.0000	0.0000	0.0000	0.0000
NEW BEDFORD	0.0014	0.0018	0.0018	0.0017	0.0023	0.0030	0.0032
NEWTON	0.0274	0.0344	0.0385	0.0440	0.0420	0.0455	0.0528
OAK BLUFFS	0.0000	0.0000	0.0052	0.0049	0.0000	0.0000	0.0000
SALEM	0.0048	0.0098	0.0121	0.0115	0.0119	0.0098	0.0111
SHIRLEY	0.0272	0.0240	0.0348	0.0487	0.0443	0.0282	0.0376
SOUTHBRIDGE	0.0034	0.0090	0.0097	0.0131	0.0121	0.0165	0.0127
SPRINGFIELD	0.0024	0.0034	0.0041	0.0058	0.0060	0.0076	0.0080
SUNDERLAND	0.0070	0.0143	0.0144	0.0423	0.0126	0.0238	0.0126
WALTHAM	0.0077	0.0106	0.0122	0.0182	0.0218	0.0261	0.0302
WAREHAM	0.0022	0.0032	0.0028	0.0044	0.0030	0.0048	0.0035
WAYLAND	0.0163	0.0204	0.0241	0.0216	0.0271	0.0325	0.0378
WESTON	0.0276	0.0319	0.0369	0.0420	0.0476	0.0479	0.0524
WORCESTER	0.0065	0.0096	0.0141	0.0157	0.0184	0.0215	0.0237

Table 78.

	1979	1980	1981	1982	1983	1984	1985
ASIAN							
AMHERST	48	70	64	59	71	67	85
AYER	122	119	118	121	118	115	131
BOSTON	2699	3324	3579	3838	4020	4310	4719
BROCKTON	117	199	231	258	263	274	301
BROOKLINE	612	646	619	601	600	645	729
CAMBRIDGE	228	270	274	326	346	389	440
CHELSEA	34	39	52	114	151	267	332
CLINTON	16	16	13	21	20	22	16
CONCORD	27	33	41	43	42	48	42
FITCHBURG	26	58	58	77	97	112	144
FRAMINGHAM	151	167	170	188	193	184	218
HOLYOKE	40	33	33	36	33	40	62
LAWRENCE	57	107	132	155	159	212	251
LEOMINSTER	35	47	74	93	70	76	65
LEXINGTON	223	203	217	247	271	319	350
LINCOLN	31	39	38	44	42	50	44
LOWELL	66	138	264	345	497	703	1086
LYNN	42	48	98	133	162	186	284
MASHPEE	3	1	1	0	0	0	0
NEW BEDFORD	21	27	26	25	32	42	45
NEWTON	357	427	448	480	437	457	512
OAK BLUFFS	0	0	1	1	0	0	0
SALEM	27	52	55	53	52	41	45
SHIRLEY	15	13	19	26	23	14	18
SOUTHBRIDGE	10	26	27	36	33	44	33
SPRINGFIELD	60	83	97	134	135	172	181
SUNDERLAND	1	2	2	6	2	4	2
WALTHAM	65	84	91	127	144	163	180
WAREHAM	8	11	9	14	9	14	10
WAYLAND	46	53	61	52	63	72	83
WESTON	63	70	76	81	89	86	91
WORCESTER	155	221	311	330	376	426	468

Table 77.

ENROLLMENTS

	1979	1980	1981	1982	1983	1984	1985
AMERICAN INDIAN							
AMHERST	0.0006	0.0013	0.0000	0.0008	0.0000	0.0000	0.0040
AYER	0.0013	0.0014	0.0026	0.0022	0.0015	0.0012	0.0004
BOSTON	0.0050	0.0044	0.0044	0.0043	0.0047	0.0051	0.0045
BROCKTON	0.0029	0.0032	0.0023	0.0022	0.0027	0.0038	0.0029
BROOKLINE	0.0005	0.0005	0.0009	0.0016	0.0014	0.0012	0.0019
CAMBRIDGE	0.0016	0.0021	0.0012	0.0011	0.0013	0.0011	0.0012
CHELSEA	0.0019	0.0008	0.0009	0.0020	0.0018	0.0009	0.0029
CLINTON	0.0000	0.0005	0.0000	0.0000	0.0005	0.0005	0.0005
CONCORD	0.0023	0.0034	0.0032	0.0028	0.0024	0.0018	0.0019
FITCHBURG	0.0015	0.0012	0.0006	0.0606	0.0002	0.0002	0.0000
FRAMINGHAM	0.0004	0.0003	0.0003	0.0005	0.0005	0.0005	0.0002
HOLYOKE	0.0008	0.0001	0.0008	0.0003	0.0001	0.0008	0.0004
LAWRENCE	0.0007	0.0007	0.0012	0.0008	0.0010	0.0011	0.0005
LEOMINSTER	0.0013	0.0008	0.0000	0.0008	0.0008	0.0008	0.0002
LEXINGTON	0.0006	0.0010	0.0004	0.0002	0.0002	0.0002	0.0002
LINCOLN	0.0569	0.0000	0.0388	0.0000	0.0398	0.0020	0.0000
LOWELL	0.0001	0.0009	0.0003	0.0014	0.0011	0.0008	0.0007
LYNN	0.0013	0.0008	0.0011	0.0006	0.0011	0.0012	0.0006
MASHPEE	0.1425	0.1792	0.1630	0.1383	0.1355	0.1307	0.1119
NEW BEDFORD	0.0001	0.0013	0.0005	0.0006	0.0006	0.0009	0.0006
NEWTON	0.0005	0.0006	0.0009	0.0007	0.0003	0.0005	0.0001
OAK BLUFFS	0.0274	0.0144	0.0206	0.0146	0.0404	0.0251	0.0199
SALEM	0.0011	0.0002	0.0013	0.0009	0.0005	0.0014	0.0012
SHIRLEY	0.0000	0.0000	0.0000	0.0019	0.0019	0.0000	0.0000
SOUTHBRIDGE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SPRINGFIELD	0.0005	0.0005	0.0003	0.0005	0.0003	0.0004	0.0004
SUNDERLAND	0.0000	0.0000	0.0000	0.0000	0.0000	0.0060	0.0000
WALTHAM	0.0001	0.0005	0.0007	0.0006	0.0011	0.0002	0.0008
WAREHAM	0.0047	0.0032	0.0028	0.0009	0.0010	0.0014	0.0010
WAYLAND	0.0004	0.0004	0.0000	0.0008	0.0004	0.0005	0.0009
WESTON	0.0004	0.0005	0.0005	0.0005	0.0005	0.0011	0.0017
WORCESTER	0.0024	0.0023	0.0024	0.0034	0.0037	0.0025	0.0024

Table 76.

ENROLLMENTS

AMERICAN INDIAN	1979	1980	1981	1982	1983	1984	1985
AMHERST	1	2	0	1	0	0	5
AYER	4	4	7	6	4	3	1
BOSTON	352	301	277	262	281	306	274
BROCKTON	55	60	42	39	45	62	46
BROOKLINE	3	3	5	9	8	7	11
CAMBRIDGE	15	18	10	9	10	9	9
CHELSEA	7	3	3	7	6	3	10
CLINTON	0	1	0	0	1	1	1
CONCORD	5	7	6	5	4	3	3
FITCHBURG	8	6	3	3	1	1	0
FRAMINGHAM	5	3	3	5	4	4	2
HOLYOKE	6	1	6	2	1	5	3
LAWRENCE	6	6	10	7	9	10	5
LEOMINSTER	8	5	0	4	4	4	1
LEXINGTON	4	6	2	1	1	1	1
LINCOLN	66	0	43	0	42	2	0
LOWELL	1	12	4	18	14	10	9
LYNN	18	11	14	8	13	14	7
MASHPEE	65	86	81	65	68	66	63
NEW BEDFORD	2	19	8	9	9	13	9
NEWTON	7	7	11	8	3	5	1
OAK BLUFFS	6	3	4	3	8	5	4
SALEM	6	1	6	4	2	6	5
SHIRLEY	0	0	0	1	1	0	0
SOUTHBRIDGE	0	0	0	0	0	0	0
SPRINGFIELD	13	13	6	12	6	10	8
SUNDERLAND	0	0	0	0	0	1	0
WALTHAM	1	4	5	4	7	1	5
WAREHAM	17	11	9	3	3	4	3
WAYLAND	1	1	0	2	1	1	2
WESTON	1	1	1	1	1	2	3
WORCESTER	58	53	52	71	75	49	47

Table 75.

MINORITY/TOTAL	1979	1980	1981	1982	1983	1984	1985
AMHERST	0.162	0.172	0.189	0.188	0.218	0.221	0.253
AYER	0.173	0.178	0.182	0.199	0.213	0.215	0.238
BOSTON	0.623	0.646	0.670	0.695	0.715	0.719	0.725
BROCKTON	0.119	0.136	0.142	0.157	0.165	0.190	0.212
BROOKLINE	0.213	0.225	0.245	0.252	0.252	0.261	0.287
CAMBRIDGE	0.338	0.349	0.368	0.395	0.419	0.436	0.459
CHELSEA	0.301	0.356	0.373	0.433	0.461	0.511	0.542
CLINTON	0.096	0.095	0.104	0.098	0.098	0.112	0.103
CONCORD	0.078	0.085	0.095	0.101	0.104	0.104	0.105
FITCHBURG	0.095	0.116	0.122	0.152	0.157	0.201	0.213
FRAMINGHAM	0.102	0.108	0.111	0.129	0.136	0.148	0.161
HOLYOKE	0.298	0.341	0.377	0.400	0.416	0.457	0.494
LAWRENCE	0.362	0.399	0.436	0.461	0.486	0.528	0.568
LEOMINSTER	0.082	0.082	0.097	0.109	0.115	0.117	0.118
LEXINGTON	0.098	0.097	0.100	0.112	0.123	0.135	0.150
LINCOLN	0.209	0.196	0.207	0.205	0.205 ·	0.207	0.206
LOWELL	0.131	0.141	0.163	0.183	0.193	0.211	0.253
LYNN	0.117	0.122	0.131	0.139	0.153	0.173	0.193
MASHPEE	0.243	0.250	0.229	0.215	0.205	0.208	0.190
NEW BEDFORD	0.183	0.186	0.186	0.192	0.202	0.201	0.202
NEWTON	0.093	0.105	0.121	0.120	0.113	0.122	0.127
OAK BLUFFS	0.155	0.163	0.170	0.180	0.162	0.121	0.104
SALEM	0.059	0.070	0.076	0.082	0.104	0.111	0.146
SHIRLEY	0.107	0.101	0.104	0.120	0.116	0.099	0.117
SOUTHBRIDGE	0.105	0.111	0.121	0.140	0.132	0.136	0.155
SPRINGFIELD	0.460	0.493	0.503	0.525	0.541	0.547	0.554
SUNDERLAND	0.021	0.057	0.058	0.141	0.126	0.119	0.057
WALTHAM	0.064	0.071	0.080	0.098	0.108	0.113	0.132
WAREHAM	0.136	0.167	0.172	0.167	0.135	0.148	0.135
WAYLAND	0.072	0.075	0.085	0.086	0.092	0.102	0.109
WESTON	0.116	0.133	0.139	0.143	0.159	0.165	0.174
WORCESTER	0.143	0.151	0.170	0.189	0.202	0.217	0.236

Table 74.

TOTAL MINORITY	1979	1980	1981	1982	1983	1984	1985
AMHERST	255	260	262	240	262	266	313
AYER	525	521	488	549	564	557	598
BOSTON	43605	43910	42197	42358	42382	43157	44030
BROCKTON	2275	2537	2553	2731	2759	3068	3312
BROOKLINE	1330	1375	1426	1412	1426	1484	1643
CAMBRIDGE	3117	3063	3044	3196	3317	3437	3576
CHELSEA	1080	1295	1286	1511	1526	1725	1867
CLINTON	220	210	223	202	190	214	192
CONCORD	169	173	176	179	176	169	161
FITCHBURG	496	583	589	730	715	901	925
FRAMINGHAM	1149	1136	1095	1191	1187	1230	1293
HOLYOKE	2325	2605	2665	2713	2792	3008	3396
LAWRENCE	2967	3214	3570	3898	4170	4615	5313
LEOMINSTER	506	490	550	577	595	575	568
LEXINGTON	634	591	572	602	635	669	709
LINCOLN	242	222	229	218	216	211	203
LOWELL	1681	1796	2026	2270	2365	2593	3118
LYNN	1624	1643	1708	1745	1828	1983	2139
MASHPEE	111	120	114	101	103	105	107
NEW BEDFORD	2777	2771	2739	2783	2867	2845	2879
NEWTON	1217	1306	1413	1305	1180	1231	1235
OAK BLUFFS	34	34	33	37	32	24	21
SALEM	331	373	346	380	458	465	592
IRLEY	59	55	57	64	60	49	56
SOUTHBRIDGE	311	320	336	386	358	361	404
SPRINGFIELD	11443	12135	11832	12126	12251	12444	12576
SUNDERLAND	3	8	8	20	20	20	9
WALTHAM	541	566	592	683	712	708	788
WAREHAM	490	569	562	529	409	434	386
WAYLAND	203	194	215	207	213	226	239
WESTON	264	293	287	275	298	296	302
WORCESTER	3404	3493	3737	3976	4114	4307	4661

Table 73.

	1979	1980	1981	1982	1983	1984	1985
TOTAL							
AMHERST	1576	1512	1388	1279	1202	1201	1239
AYER	3035	2923	2685	2760	2648	2589	2508
BOSTON	69973	67981	62989	60950	59303	59987	60704
BROCKTON	19128	18668	17929	17383	16699	16164	15602
BROOKLINE	6246	6107	5831	5610	5662	5688	5721
CAMBRIDGE	9220	8767	8276	8089	7913	7888	7797
CHELSEA	3591	3641	3447	3490	3309	3379	3447
CLINTON	2302	2210	2136	2064	1944	1916	1859
CONCORD	2180	2043	1859	1772	1686	1629	1540
FITCHBURG	5205	5020	4819	4789	4560	4484	4349
FRAMINGHAM	11282	10557	9897	9266	8739	8304	8049
HOLYOKE	7809	7648	7061	6785	6713	6578	6877
LAWRENCE	8201	8058	8197	8453	8580	8738	9358
LEOMINSTER	6182	5955	5653	5306	5153	4897	4806
LEXINGTON	6502	6082	5694	5387	5179	4952	4713
LINCOLN	1159	1131	1108	1066	1056	1017	984
LOWELL	12828	12708	12427	12420	12234	12263	12341
LYNN	13914	13447	12989	12535	11986	11476	11108
MASHPEE	456	480	497	470	502	505	563
NEW BEDFORD	15160	14924	14745	14464	14204	14133	14277
NEWTON	13050	12426	11635	10898	10411	10054	9700
OAK BLUFFS	219	208	194	206	198	199	201
SALEM	5586	5329	4550	4612	4383	4172	4059
SHIRLEY	551	542	546	534	519	497	479
SOUTHBRIDGE	2948	2879	2786	2755	2717	2659	2603
SPRINGFIELD	24874	24613	23531	23087	22653	22768	22686
SUNDERLAND	142	140	139	142	159	168	159
WALTHAM	8474	7954	7436	6986	6599	6241	5966
WAREHAM	3597	3399	3258	3164	3029	2940	2861
WAYLAND	2819	2599	2529	2406	2323	2212	2196
WESTON	2279	2195	2059	1928	1869	1796	1736
WORCESTER	23854	23109	22005	21013	20411	19805	19763

MASSACHUSETTS SCHOOL SYSTEMS

Minority Enrollment Larger Than 10%
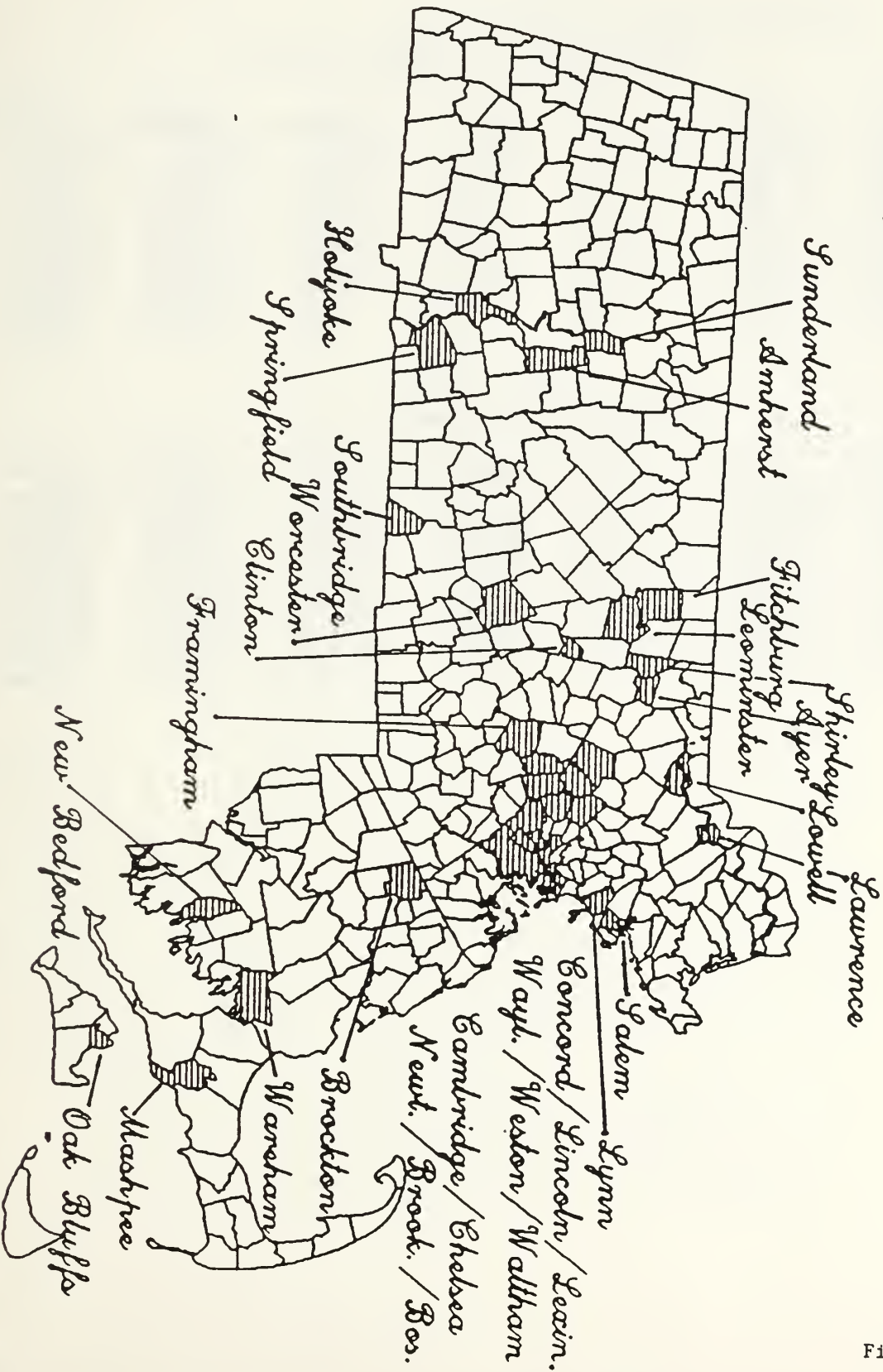
Figure 107.

Table 72.

ENROLLMENT IN PRIVATE SCHOOLS
STATE TOTALS BY RACE

OCT.REF.	AMIND	BLACK	ASIAN	HISPNW	HISPW	WHITE	TOTAL
1979	481	3759	759	701	2894	89223	97817
1980	85	4931	1215	989	2010	117096	126326
1981	145	5376	1416	1087	2246	123160	133430
1982	87	5385	1469	1059	1962	125176	135138
1983	122	6066	1739	1072	2207	125536	136742
1984	113	5247	1843	968	2273	124665	135109
1985	131	6786	1916	1155	2322	120404	132714

PERCENTAGES BY RACE

	AMIND	BLACK	ASIAN	HISPNW	HISPW	WHITE	TOTAL
1979	0.0049	0.0384	0.0078	0.0072	0.0296	0.9121	1.0000
1980	0.0007	0.0390	0.0096	0.0078	0.0159	0.9269	1.0000
1981	0.0011	0.0403	0.0106	0.0081	0.0168	0.9230	1.0000
1982	0.0006	0.0398	0.0109	0.0078	0.0145	0.9263	1.0000
1983	0.0009	0.0444	0.0127	0.0078	0.0161	0.9181	1.0000
1984	0.0008	0.0388	0.0136	0.0072	0.0168	0.9227	1.0000
1985	0.0010	0.0511	0.0144	0.0087	0.0175	0.9072	1.0000

Table 71.

ENROLLMENT IN PUBLIC SCHOOLS
STATE TOTALS BY RACE

OCT.REF.	AM.IND.	BLACK	ASIAN	HISP.NW.	HISP.W.	WHITE	TOTAL
1979	1128	59248	8795	7731	32062	815890	924854
1980	1040	58602	10542	7714	26005	784080	887983
1981	933	56229	11558	8138	26209	736891	839958
1982	877	55936	12892	9226	27159	697495	803585
1983	958	55043	13778	9535	28172	667213	774699
1984	930	55098	15336	9422	30738	643738	755262
1985	856	55842	17431	11177	31783	622256	739345

PERCENTAGES BY RACE

	AM.IND.	BLACK	ASIAN	HISP.NW.	HISP.W.	WHITE	TOTAL
1979	0.0012	0.0641	0.0095	0.0084	0.0347	0.8822	1.0000
1980	0.0012	0.0660	0.0119	0.0087	0.0293	0.8830	1.0000
1981	0.0011	0.0669	0.0138	0.0097	0.0312	0.8773	1.0000
1982	0.0011	0.0696	0.0160	0.0115	0.0338	0.8680	1.0000
1983	0.0012	0.0711	0.0178	0.0123	0.0364	0.8613	1.0000
1984	0.0012	0.0730	0.0203	0.0125	0.0407	0.8523	1.0000
1985	0.0012	0.0755	0.0236	0.0151	0.0430	0.8416	1.0000

Figure 106.

PERCENTAGES

ENROLLMENT IN PUBLIC SCHOOLS

STATE TOTALS BY RACE

Figure 105.

ENROLLMENT IN PUBLIC SCHOOLS
STATE TOTALS BY RACE
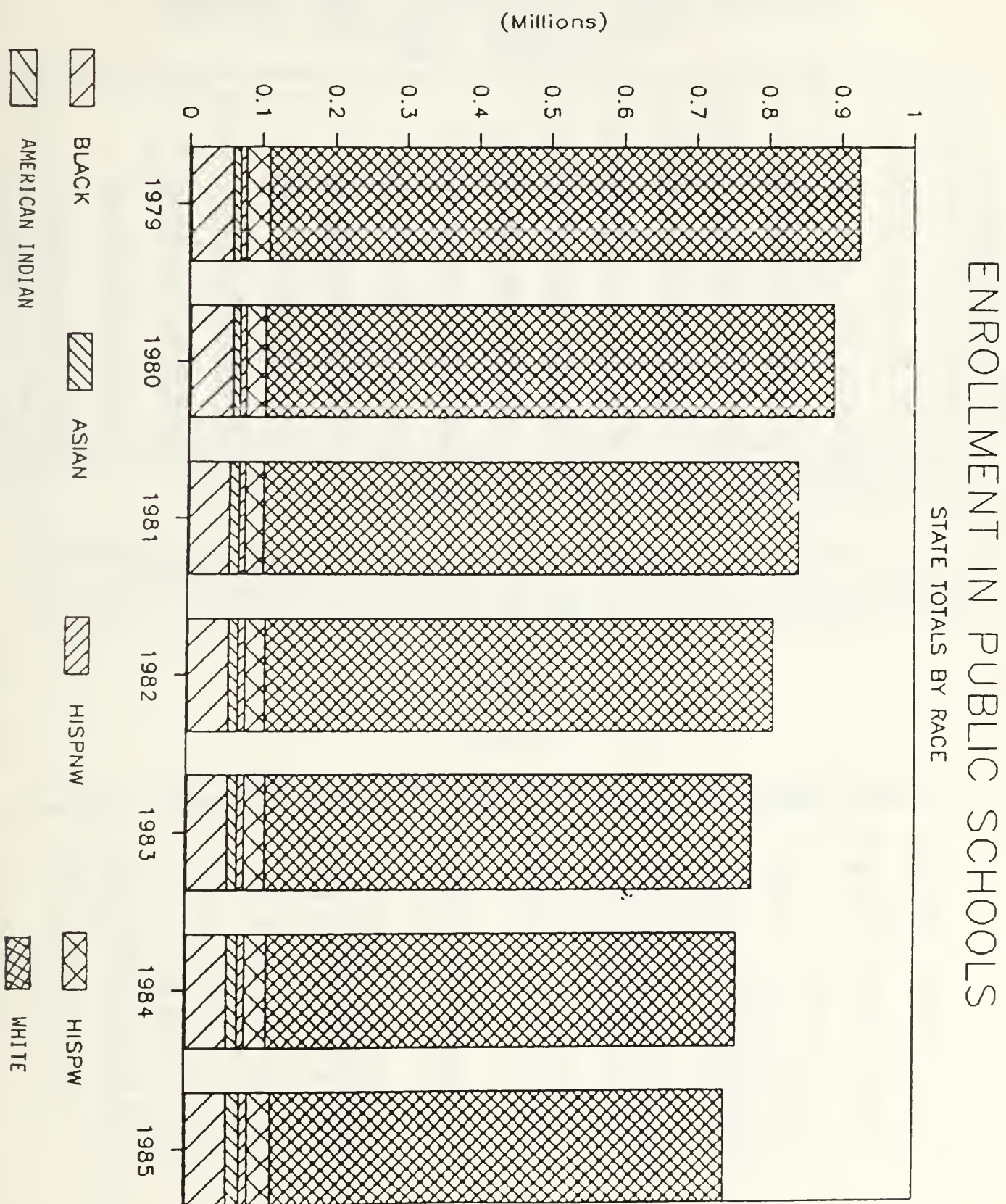
Figure 104.

HIRING AND RETENTION 1982 TO 1995
VOCATIONAL STUDIES

YEARS
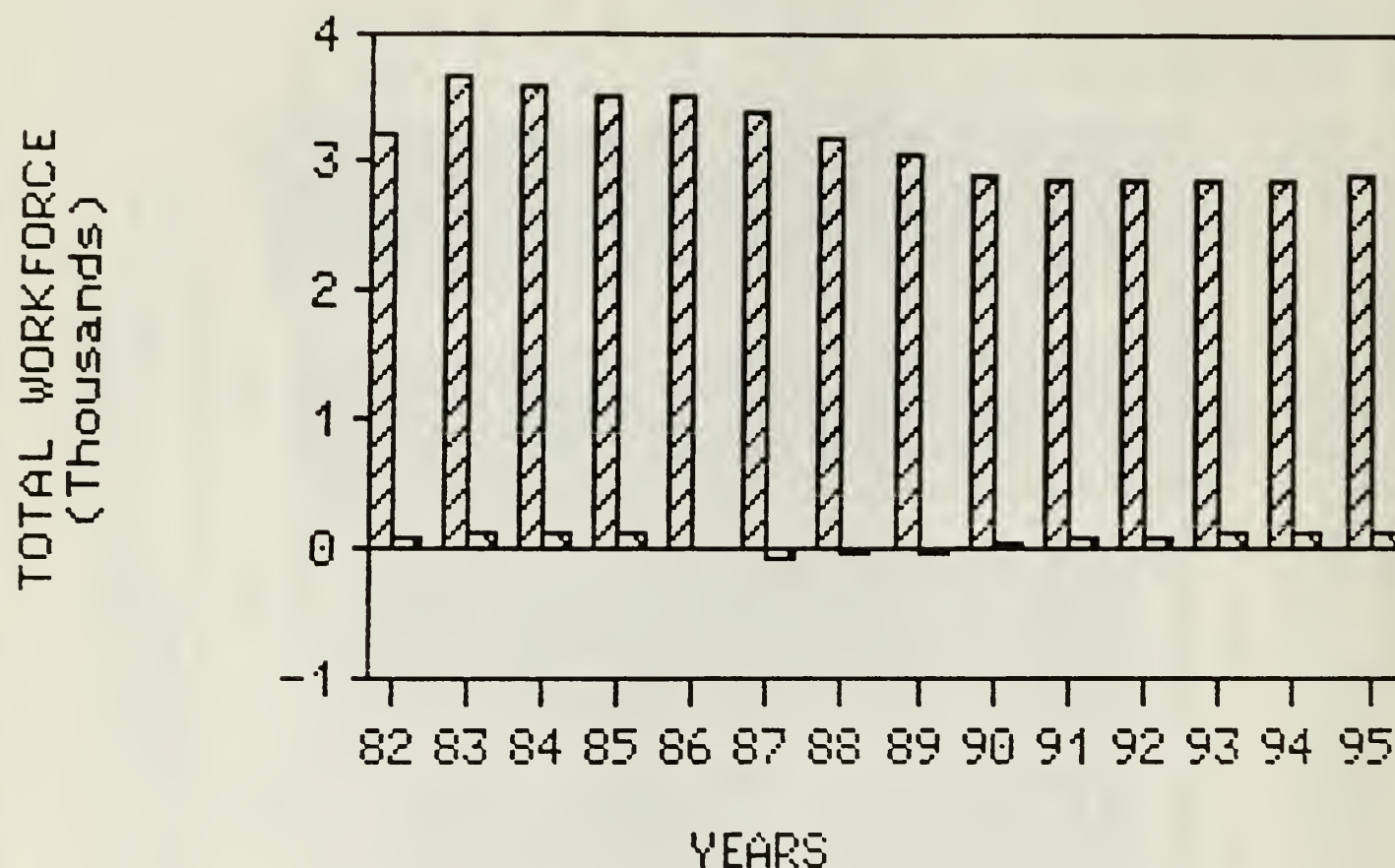
Table 70.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	3239	103	3932	0.8	0.18	23	4	367062		
83	3660	129	3819	0.93	0.04	23	4	356784		
84	3599	134	3741	0.94	0.04	23	4	356948		
85	3514	149	3656	0.94	0.04	23	4	332996		
86	3525	-7	3525	0.96	0	23	4	320554		
87	3386	-58	3386	0.96	0	22	4	303246	174	231
88	3210	-51	3210	0.95	0	22	4	287812	155	206
89	3054	-33	3054	0.95	0	23	4	275286	114	146
90	2926	38	2964	0.96	0.01	23	4	270023	94	57
91	2870	83	2953	0.97	0.03	23	4	270576	83	0
92	2858	96	2954	0.97	0.03	23	4	273425	96	0
93	2856	115	2972	0.97	0.04	24	4	279807	115	0
94	2872	131	3003	0.97	0.04	24	4	286598	131	0
95	2900	147	3047	0.97	0.05	24	4	293532	147	0

Figure 103.

HIRING AND RETENTION 1982 TO 1995
ART STUDIES

Table 69.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	2174	124	2861	0.73	0.24	15	8	336885		
83	2604	125	2886	0.91	0.1	14	8	321929		
84	2702	191	2851	0.94	0.05	13	8	304776		
85	2673	184	2895	0.94	0.08	12	8	286466		
86	2788	-44	2788	0.96	0	12	8	271571		
87	2636	8	2644	0.95	0	12	8	261651	279	270
88	2541	69	2610	0.96	0.03	12	8	258273	235	166
89	2508	109	2617	0.96	0.04	12	8	259019	184	75
90	2513	129	2642	0.96	0.05	12	8	261448	180	51
91	2534	167	2701	0.96	0.06	12	8	267333	194	27
92	2588	174	2762	0.96	0.06	12	8	273349	210	36
93	2645	177	2822	0.96	0.06	12	8	279257	221	43
94	2701	191	2892	0.96	0.07	12	8	286165	233	42
95	2766	193	2960	0.96	0.07	12	8	292879	247	54

Figure 102.

HIRING AND RETENTION 1982 TO 1995
HEALTH STUDIES

Table 68.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	2321	51	2732	0.81	0.15	29	8	625992		
83	2578	69	2748	0.94	0.06	27	8	597964		
84	2626	76	2697	0.96	0.03	26	8	570136		
85	2599	105	2753	0.96	0.06	25	8	547328		
86	2645	33	2679	0.96	0.01	25	8	532583		
87	2558	45	2604	0.96	0.02	25	8	517693	286	240
88	2487	41	2528	0.96	0.02	25	8	502615	259	218
89	2416	32	2448	0.96	0.01	25	8	486742	228	196
90	2341	54	2395	0.96	0.02	25	8	476212	206	152
91	2290	95	2385	0.96	0.04	25	8	474194	185	90
92	2278	126	2407	0.96	0.05	25	8	478560	178	49
93	2297	153	2449	0.95	0.06	25	8	487012	182	29
94	2334	167	2501	0.95	0.07	25	8	497350	194	27
95	2381	184	2565	0.95	0.07	25	8	509986	211	27

Figure 101.

HIRING AND RETENTION 1982 TO 1995
OTHER LANGUAGES

Table 67.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	289	14	351	0.78	0.18	11	4	15095		
83	324	11	359	0.92	0.1	10	4	14471		
84	345	13	368	0.96	0.06	10	4	14095		
85	350	20	360	0.95	0.03	10	4	14015		
86	345	7	352	0.96	0.02	10	4	13690		
87	335	-3	335	0.95	0	10	4	12955	31	34
88	317	-9	317	0.95	0	9	4	12022	38	47
89	295	-5	295	0.93	0	10	4	11325	29	33
90	279	1	279	0.94	0	10	4	10881	20	19
91	268	7	275	0.96	0.03	10	4	10698	17	10
92	263	15	278	0.96	0.05	10	4	10820	24	10
93	265	21	286	0.95	0.07	10	4	11139	33	12
94	272	17	290	0.95	0.06	10	4	11281	38	21
95	276	23	298	0.95	0.08	10	4	11622	44	21

Figure 100.

HIRING AND RETENTION 1982 TO 1995
SPANISH

Table 66.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	614	26	711	0.83	0.14	16	4	44624		
83	650	34	733	0.91	0.11	15	4	42729		
84	688	57	768	0.94	0.1	13	4	41318		
85	721	66	812	0.94	0.11	13	4	40918		
86	783	26	809	0.96	0.03	13	4	40753		
87	772	2	774	0.95	0	13	4	38971	45	43
88	741	-19	741	0.96	0	12	4	36382	52	71
89	694	-19	694	0.94	0	12	4	34012	45	64
90	651	-6	651	0.94	0	12	4	32466	33	39
91	622	8	629	0.96	0.01	13	4	31697	26	18
92	607	24	631	0.96	0.04	13	4	31797	24	0
93	607	29	636	0.96	0.05	13	4	32572	29	0
94	511	37	648	0.96	0.06	13	4	33179	37	0
95	622	43	665	0.96	0.06	13	4	34009	43	0

Figure 99.

HIRING AND RETENTION 1982 TO 1995
FRENCH

YEARS

Table 65.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	572	18	702	0.8	0.19	16	4	44624		
83	662	31	698	0.94	0.05	15	4	42729		
84	657	51	677	0.94	0.03	15	4	41318		
85	620	34	689	0.92	0.1	15	4	40918		
86	662	24	685	0.96	0.03	15	4	40753		
87	660	-5	660	0.96	0	15	4	38971	51	56
88	631	-19	631	0.96	0	14	4	36382	59	78
89	592	-19	592	0.94	0	14	4	34012	46	65
90	555	-9	555	0.94	0	15	4	32466	31	40
91	531	3	533	0.96	0	15	4	31697	26	23
92	518	17	535	0.97	0.03	15	4	31797	24	8
93	519	29	548	0.97	0.05	15	4	32572	30	1
94	530	28	558	0.97	0.05	15	4	33179	38	10
95	539	33	572	0.97	0.06	15	4	34009	48	15

Figure 98.

HIRING AND RETENTION 1982 TO 1995
SOCIAL STUDIES
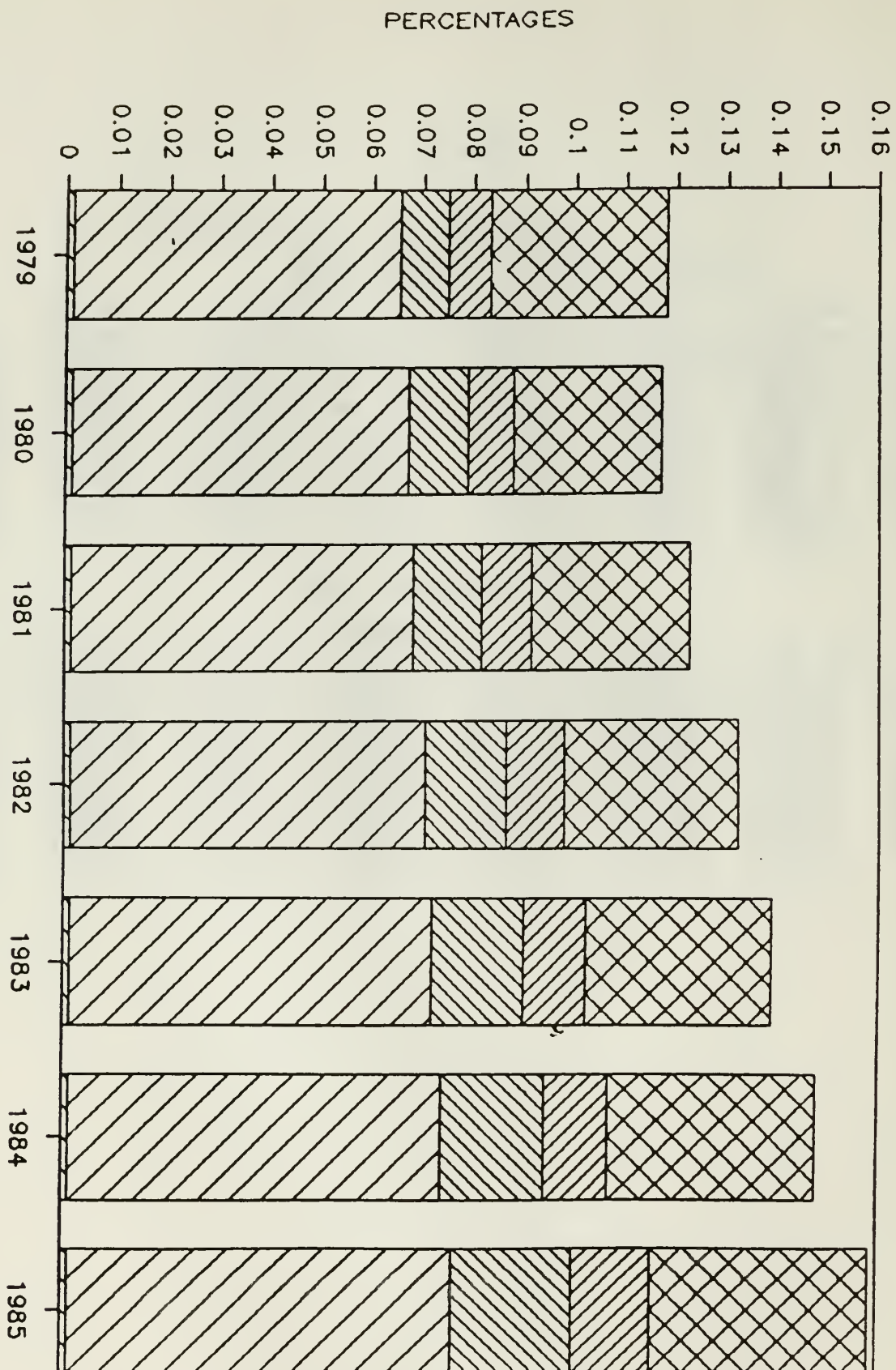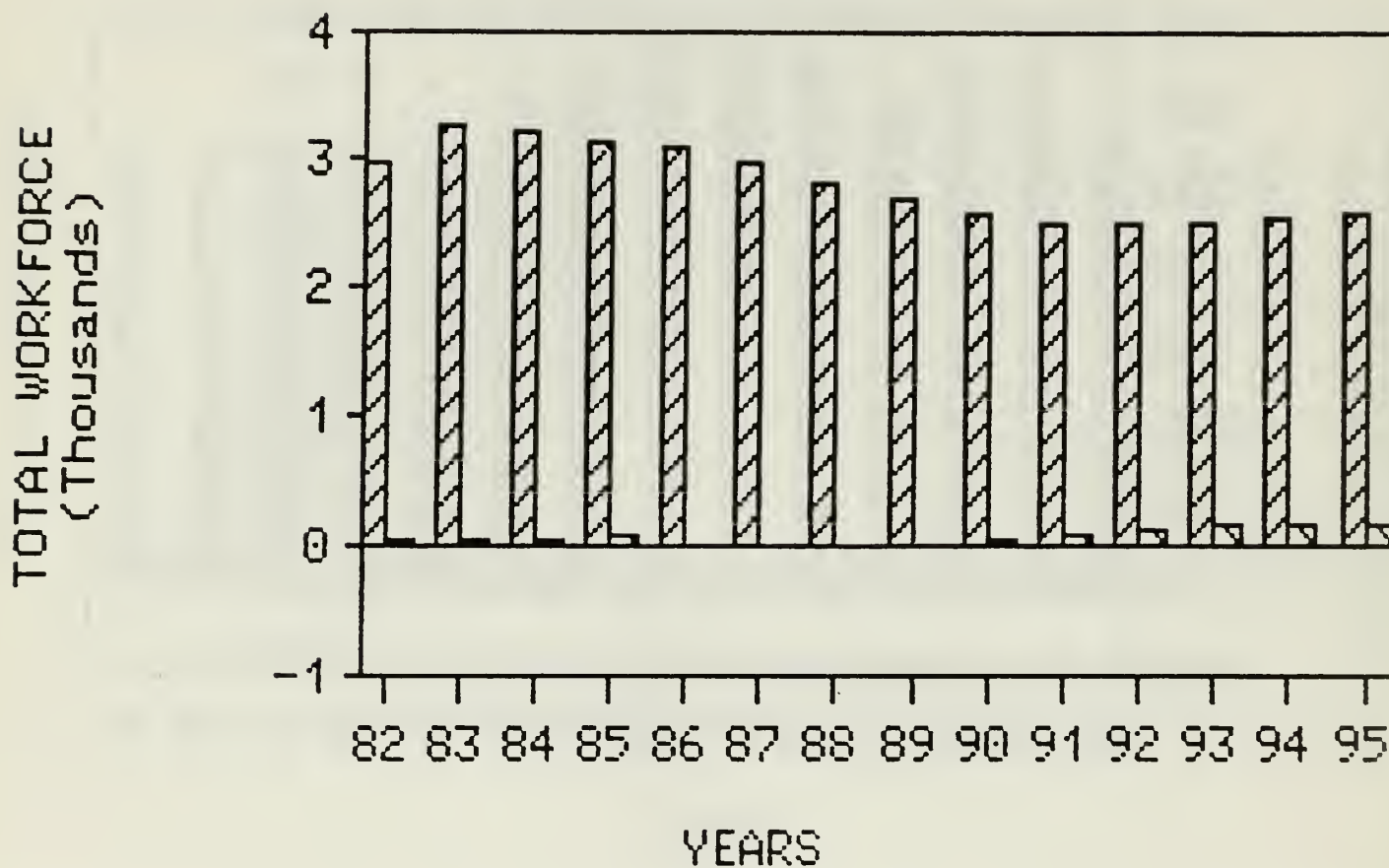

Table 64.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	3011	39	3407	0.86	0.12	29	4	398538		
83	3255	65	3358	0.96	0.03	29	4	386607		
84	3219	60	3277	0.96	0.02	29	4	374305		
85	3148	70	3227	0.96	0.02	28	4	360359		
86	3101	18	3119	0.96	0.01	28	4	348328		
87	2975	-1	2975	0.95	0	28	4	332165	265	266
88	2843	-10	2843	0.96	0	28	4	316360	231	242
89	2711	-10	2711	0.95	0	28	4	301703	186	195
90	2589	47	2635	0.95	0.02	28	4	294311	149	103
91	2525	102	2627	0.96	0.04	28	4	293397	126	24
92	2514	132	2646	0.96	0.05	28	4	295532	132	0
93	2528	150	2678	0.96	0.06	28	4	301628	150	0
94	2556	167	2723	0.95	0.06	28	4	308742	167	0
95	2595	186	2781	0.95	0.07	28	4	316478	186	0

Figure 97.

HIRING AND RETENTION 1982 TO 1995
CHEMISTRY
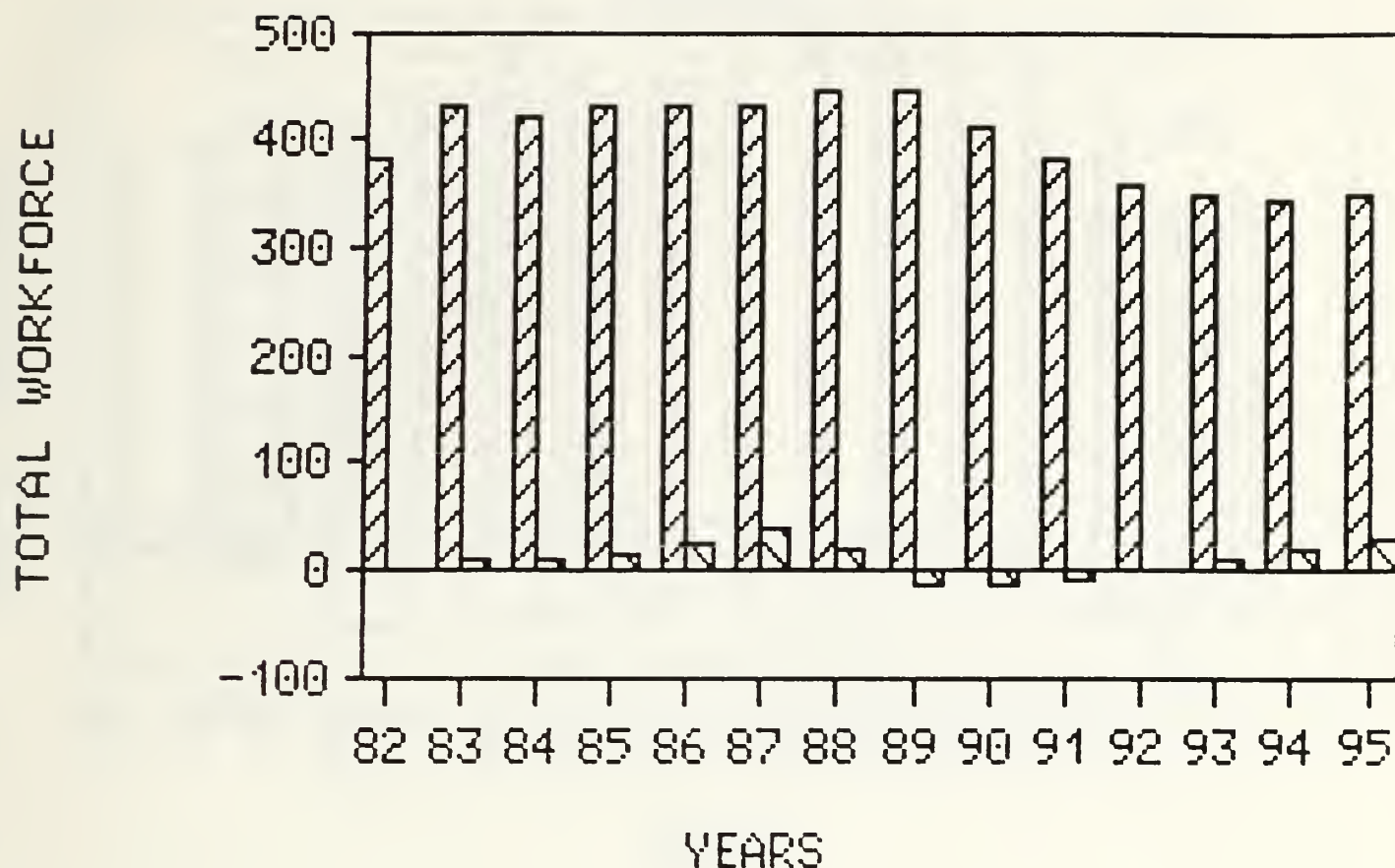
Table 63.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	386	2	446	0.9	0.13	18	4	31476		
83	434	11	438	0.97	0.01	17	4	29823		
84	421	11	448	0.96	0.06	16	4	28357		
85	432	17	450	0.96	0.04	15	4	27363		
86	433	25	457	0.96	0.05	15	4	27774		
87	434	39	473	0.95	0.08	15	4	28920	39	0
88	449	21	470	0.95	0.04	15	4	28548	49	28
89	446	-11	446	0.95	0	15	4	26418	59	70
90	414	-14	414	0.93	0	15	4	24288	60	75
91	382	-6	382	0.92	0	15	4	22821	46	52
92	360	4	364	0.94	0.01	15	4	22107	34	30
93	348	11	359	0.96	0.03	15	4	21822	30	19
94	344	21	365	0.96	0.06	15	4	22144	36	15
95	348	30	378	0.95	0.08	15	4	22946	44	14

Figure 96.

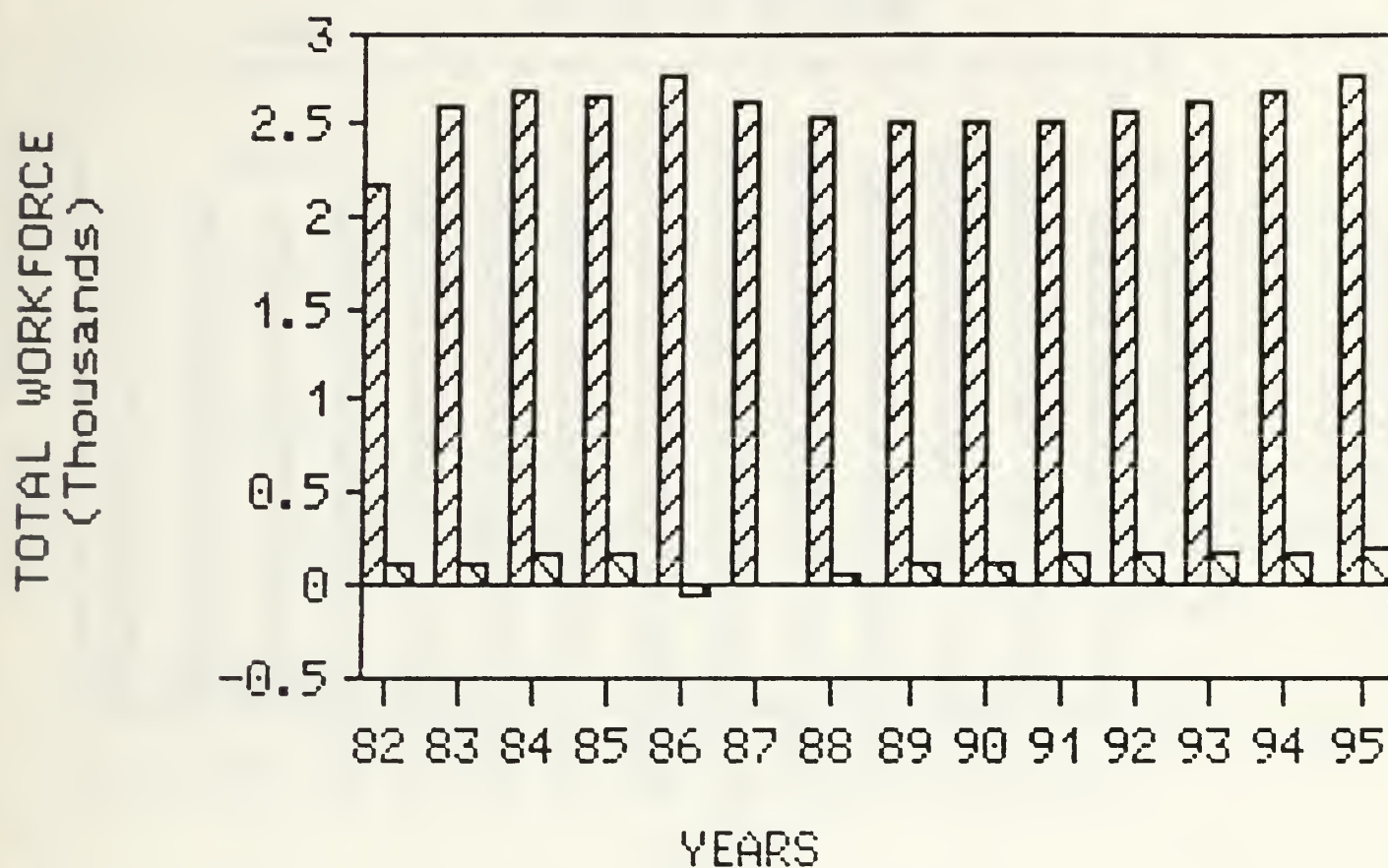# HIRING AND RETENTION 1982 TO 1995
PHYSICS

Table 62.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	212	3	247	0.9	0.14	16	4	15535		
83	239	9	250	0.97	0.04	15	4	14802		
84	238	15	258	0.95	0.08	13	4	13891		
85	241	16	256	0.93	0.06	13	4	13479		
86	245	7	252	0.96	0.03	13	4	13451		
87	226	16	242	0.9	0.07	14	4	13869	16	0
88	223	24	247	0.92	0.1	15	4	14569	24	0
89	228	28	256	0.92	0.11	13	4	13537	28	0
90	235	1	236	0.92	0	13	4	12461	34	33
91	218	-1	218	0.92	0	13	4	11446	39	41
92	201	7	208	0.9	0.03	13	4	11005	38	31
93	193	10	203	0.93	0.05	13	4	10741	29	19
94	189	14	203	0.93	0.07	13	4	10714	30	16
95	188	21	209	0.93	0.1	13	4	11056	37	15

Figure 95.

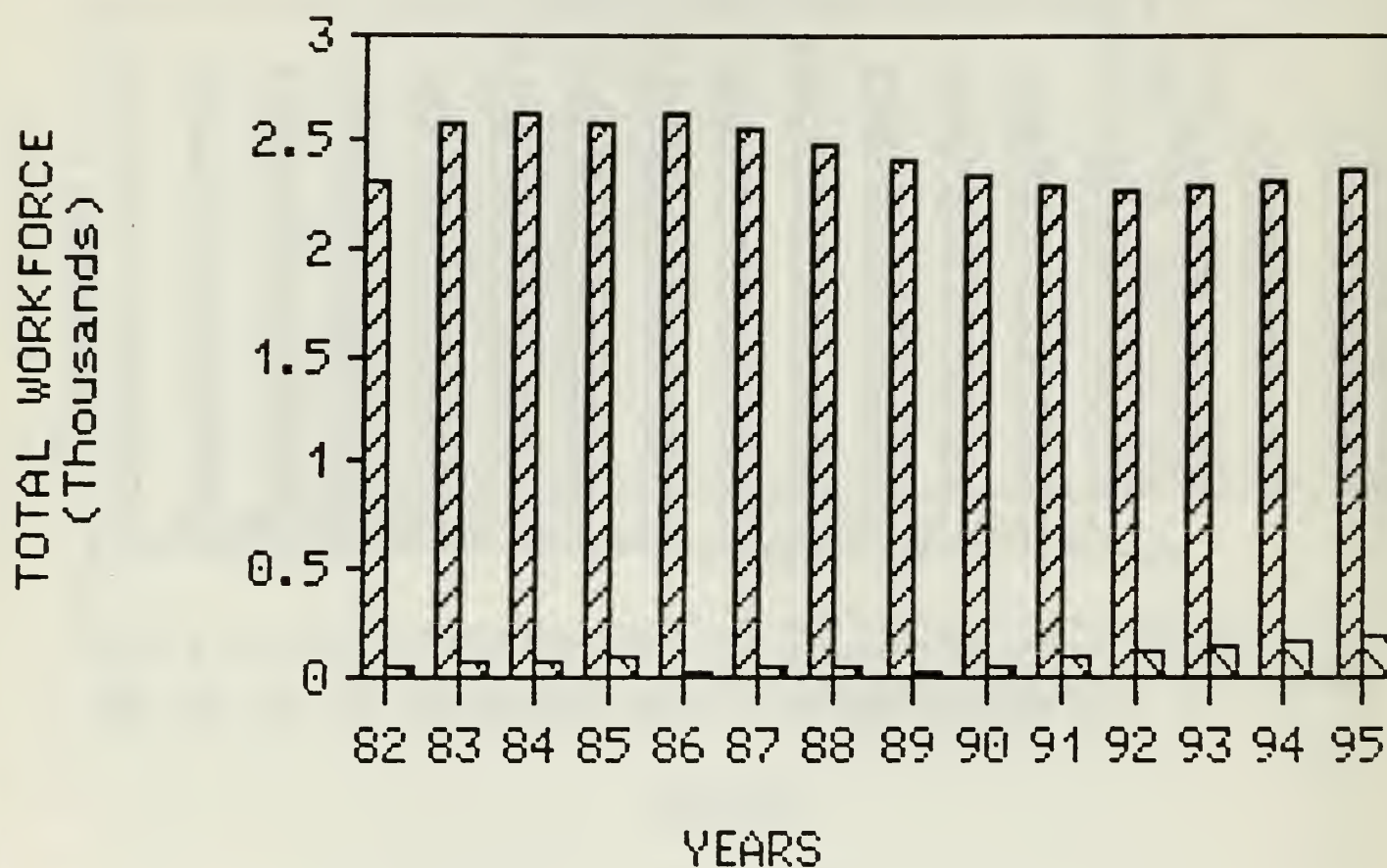# HIRING AND RETENTION 1982 TO 1995
BIOLOGY

Table 61.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	699	14	772	0.89	0.09	24	4	72749		
83	742	13	767	0.96	0.03	23	4	69793		
84	750	24	764	0.98	0.02	22	4	66416		
85	741	26	778	0.97	0.05	21	4	65770		
86	748	65	813	0.96	0.08	21	4	68830		
87	766	3	769	0.94	0	21	4	65122	87	84
88	731	-15	731	0.95	0	21	4	60558	100	115
89	681	-24	681	0.93	0	20	4	55663	92	116
90	628	-1	628	0.92	0	21	4	53116	67	68
91	600	10	610	0.95	0.02	21	4	51595	51	42
92	582	23	606	0.96	0.04	21	4	51284	45	22
93	578	43	621	0.95	0.07	21	4	52561	51	8
94	591	53	644	0.95	0.08	21	4	54532	58	5
95	611	35	646	0.95	0.05	21	4	54713	68	32

Figure 94.

HIRING AND RETENTION 1982 TO 1995
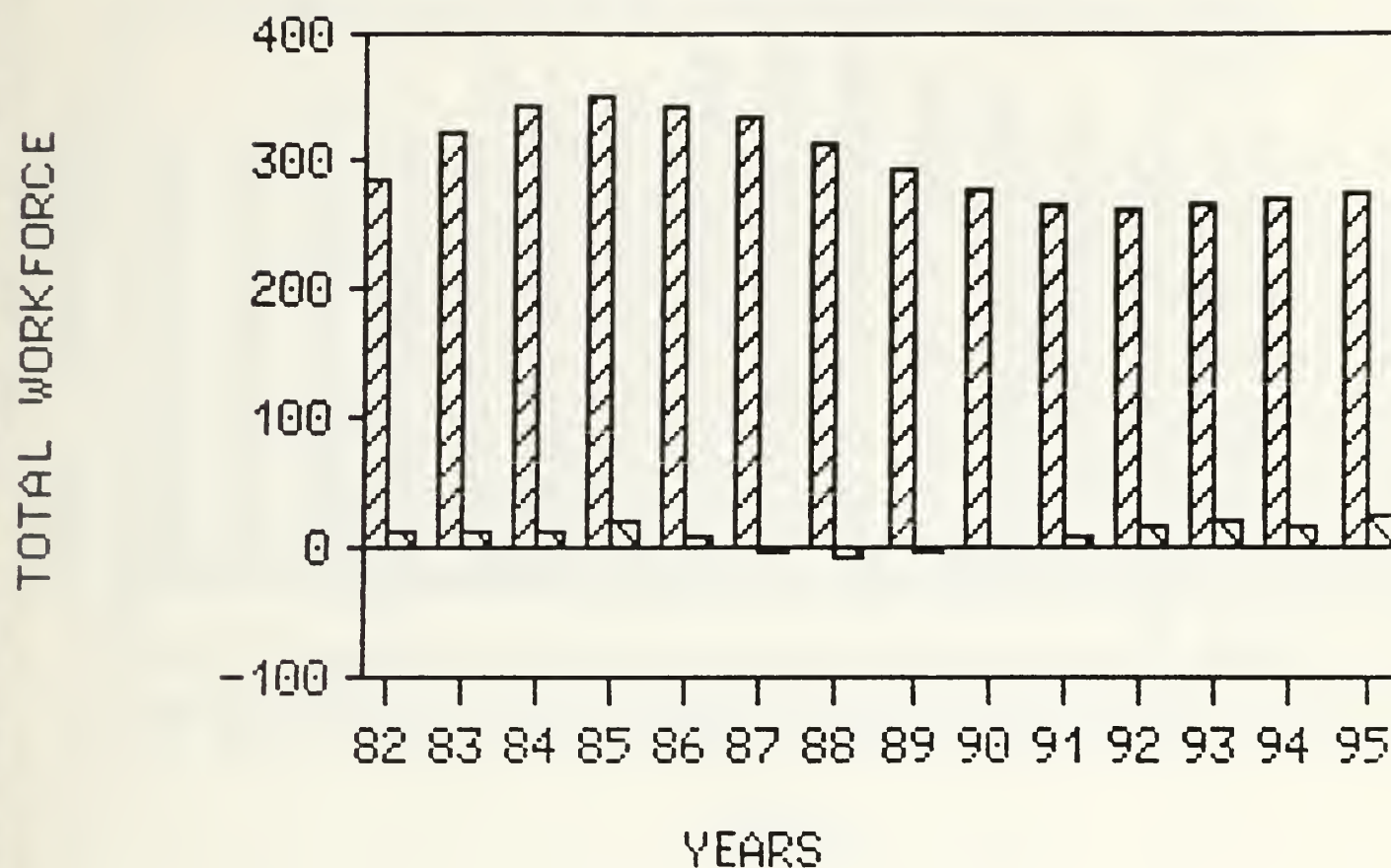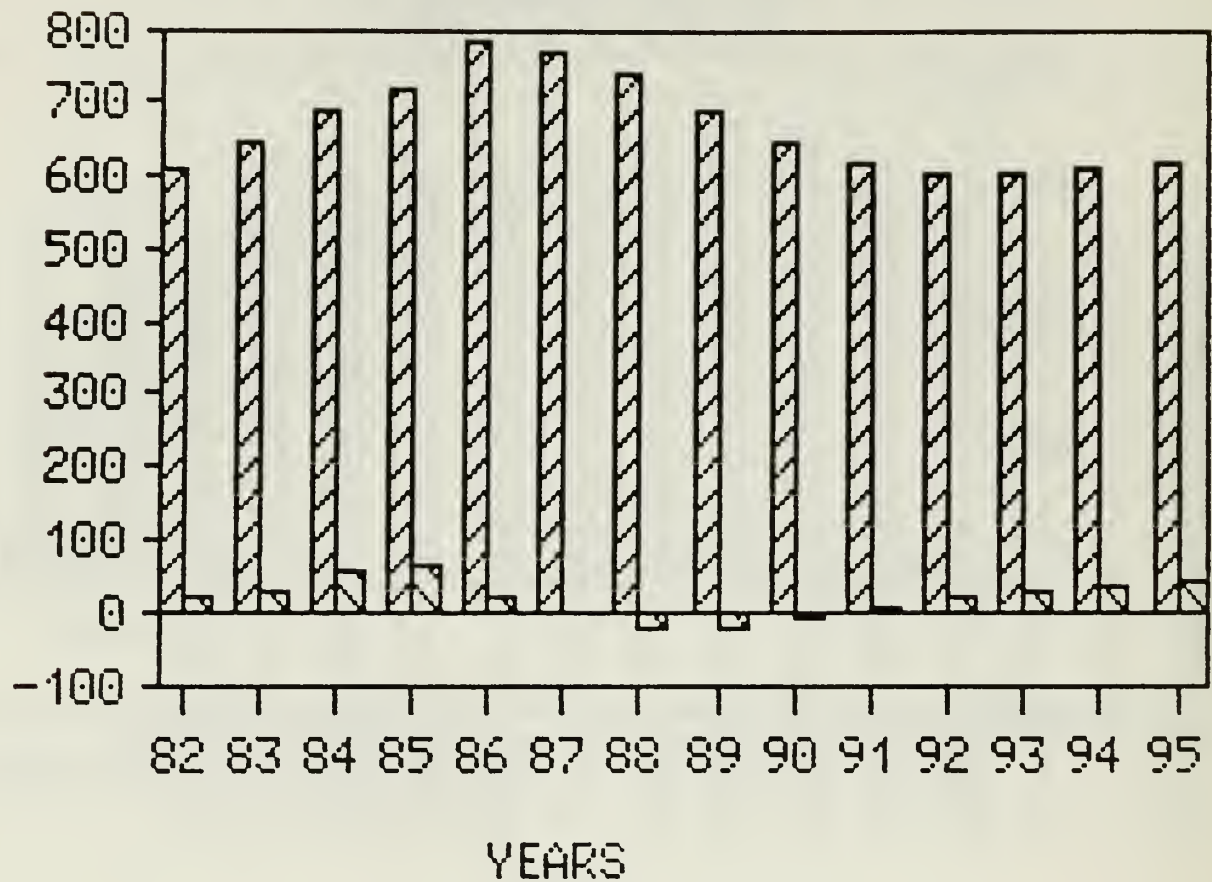## GENERAL SCIENCE
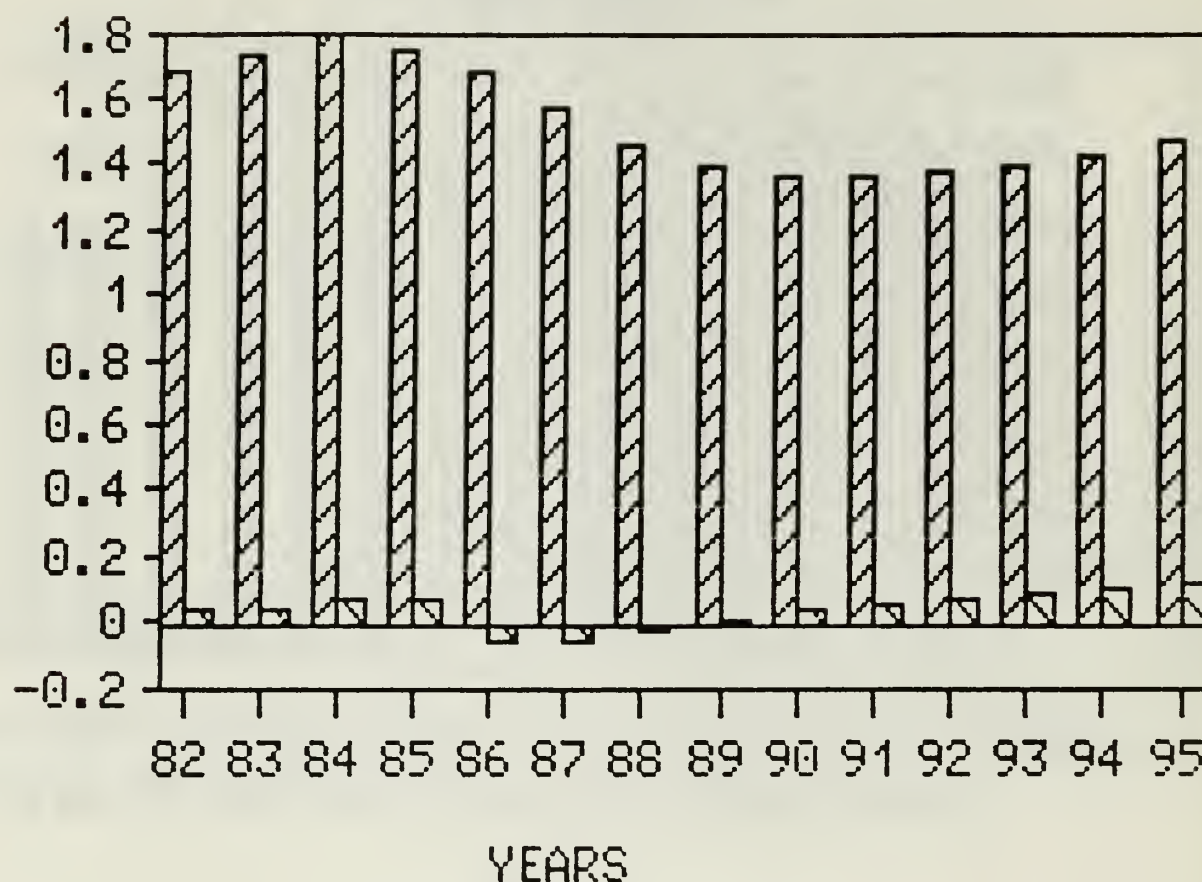
Table 60.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	1680	34	1849	0.86	0.09	32	4	234449		
83	1735	35	1885	0.94	0.08	30	4	229898		
84	1796	67	1837	0.95	0.02	31	4	224969		
85	1756	69	1754	0.96	0	30	4	213796		
86	1683	-61	1683	0.96	0	29	4	197699		
87	1572	-58	1572	0.93	0	29	4	184530	116	174
88	1463	-22	1463	0.93	0	30	4	175531	98	121
89	1393	15	1408	0.95	0.01	30	4	171615	71	56
90	1361	49	1411	0.97	0.03	30	4	171907	58	9
91	1362	63	1425	0.97	0.04	31	4	175984	63	0
92	1373	81	1454	0.96	0.06	31	4	179804	81	0
93	1399	92	1491	0.96	0.06	31	4	184654	92	0
94	1412	103	1535	0.96	0.07	31	4	188698	103	0
95	1473	117	1590	0.96	0.07	31	4	194325	117	0

Figure 95.

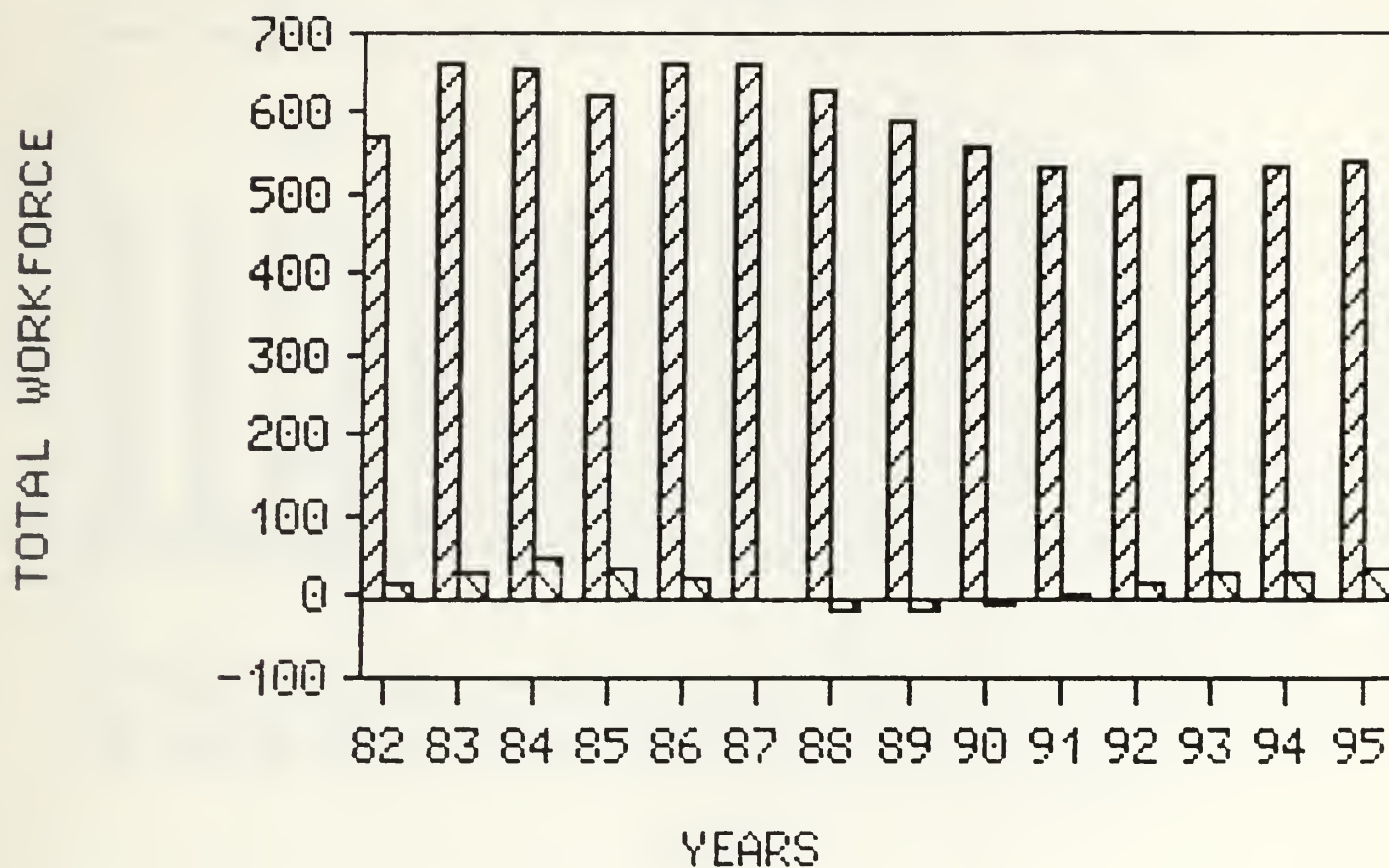# HIRING AND RETENTION 1982 TO 1995 MATHEMATICS

Table 59.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	3320	92	3672	0.88	0.1	23	4	340497		
83	3484	139	3797	0.95	0.08	22	4	327799		
84	3616	164	3765	0.95	0.04	21	4	318719		
85	3577	187	3758	0.95	0.05	21	4	311021		
86	3597	88	3685	0.96	0.02	21	4	305011		
87	3526	3	3529	0.96	0	21	4	292086	187	184
88	3370	-31	3370	0.95	0	21	4	276363	204	235
89	3194	-47	3194	0.95	0	20	4	260435	169	216
90	3014	5	3019	0.94	0	21	4	249924	132	126
91	2894	79	2973	0.96	0.03	21	4	246060	111	32
92	2847	113	2960	0.96	0.04	21	4	248030	113	0
93	2831	131	2963	0.96	0.04	21	4	251382	131	0
94	2830	154	2984	0.96	0.05	22	4	257550	154	0
95	2847	173	3020	0.95	0.06	22	4	264092	173	0

Figure 92.

HIRING AND RETENTION 1982 TO 1995 ENGLISH

Table 58.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	3822	105	4349	0.86	0.12	27	4	477229		
83	4098	119	4316	0.94	0.05	27	4	461166		
84	4107	117	4236	0.95	0.03	26	4	445197		
85	4058	124	4154	0.96	0.02	26	4	428767		
86	3988	59	4047	0.96	0.01	26	4	417764		
87	3852	67	3918	0.95	0.02	26	4	404465	270	203
88	3735	21	3756	0.95	0.01	26	4	387731	257	235
89	3584	-21	3584	0.95	0	26	4	367748	234	256
90	3404	35	3440	0.95	0.01	26	4	355031	207	172
91	3287	108	3395	0.96	0.03	26	4	350451	169	61
92	3242	156	3399	0.95	0.05	26	4	350801	162	6
93	3241	180	3422	0.95	0.05	26	4	356183	180	0
94	3259	207	3466	0.95	0.06	26	4	364103	207	0
95	3298	232	3530	0.95	0.07	26	4	373843	232	0

Figure 91.

HIRING AND RETENTION 1982 TO 1995
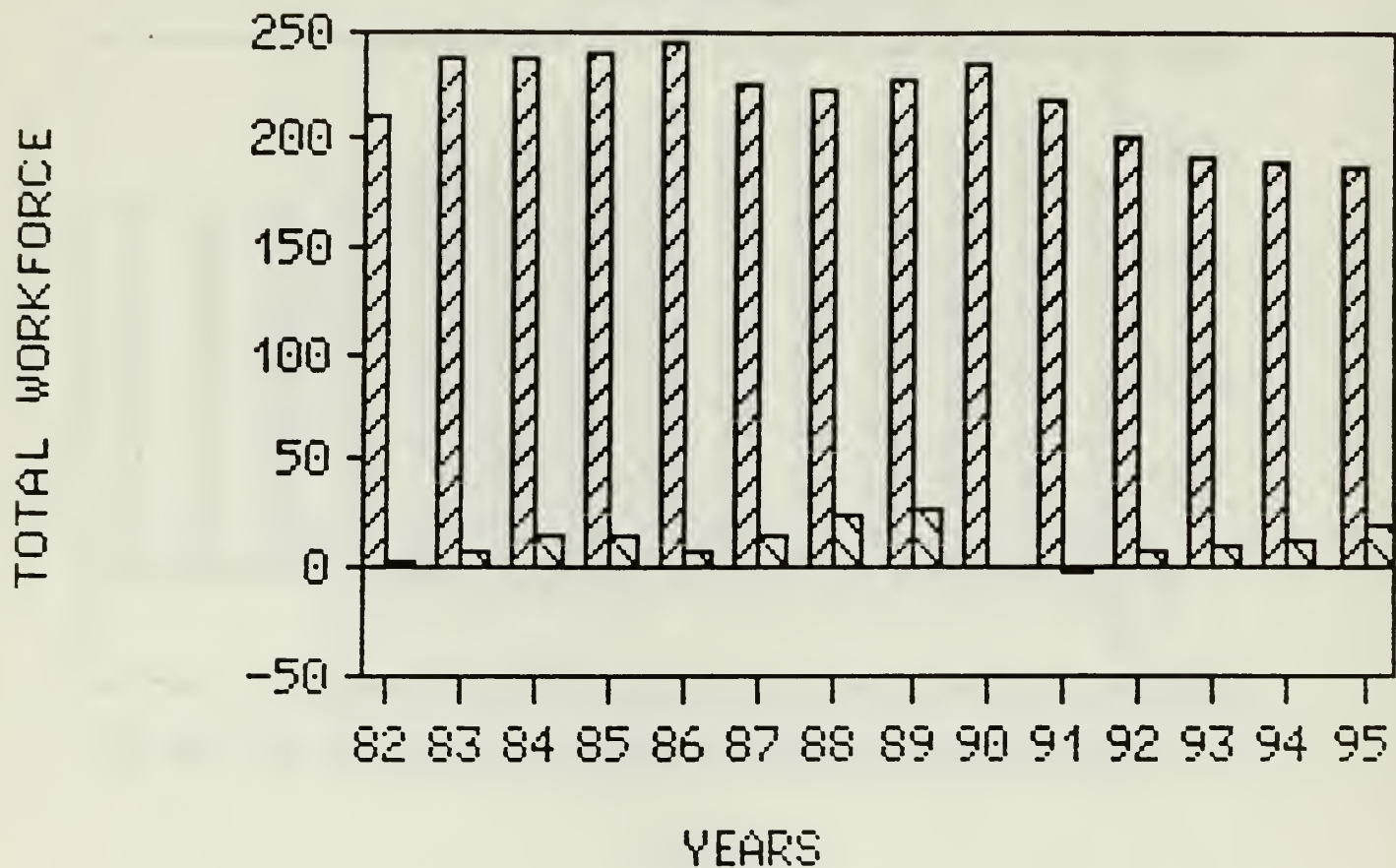## ELEMENTARY & MIDDLE

Table 57.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	15483	188	17843	0.85	0.13	23	1	417289		
83	16868	325	17038	0.95	0.01	23	1	395524		
84	16151	397	17122	0.95	0.06	22	1	380410		
85	16357	586	17446	0.96	0.06	21	1	374878		
86	16388	966	17354	0.94	0.06	21	1	372939		
87	16890	640	17530	0.97	0.04	21	1	376724	1175	535
88	16699	1159	17858	0.95	0.06	21	1	383776	1321	162
89	16989	1307	18296	0.95	0.07	21	1	393180	1312	4
90	17383	1316	18699	0.95	0.07	21	1	401851	1382	65
91	17751	1366	19117	0.95	0.07	21	1	410831	1534	168
92	18136	1459	19594	0.95	0.07	21	1	421082	1655	196
93	18577	1428	20005	0.95	0.07	21	1	429900	1747	319
94	18960	1431	20391	0.95	0.07	21	1	438205	1842	411
95	19323	1415	20739	0.95	0.07	21	1	445673	1934	519

Figure 90.

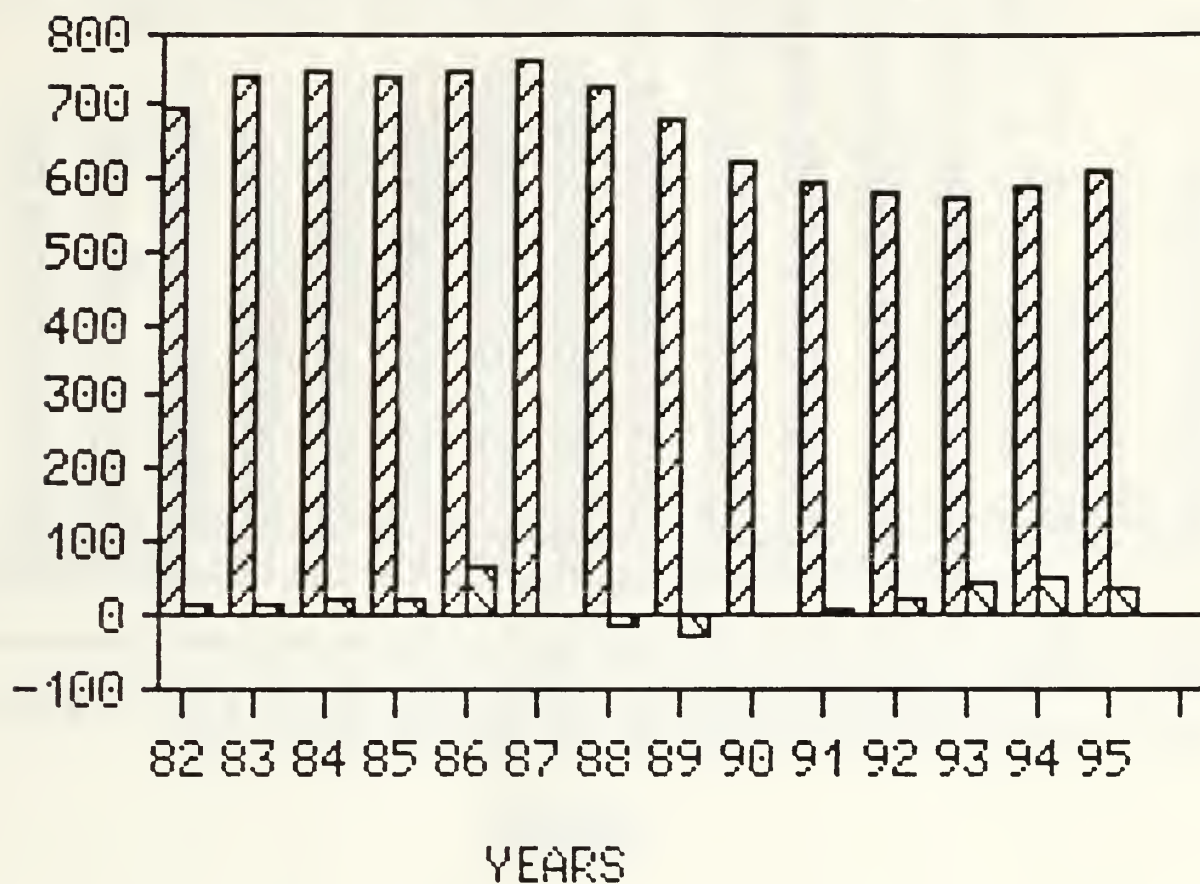# HIRING AND RETENTION 1982 TO 1995
EARLY CHILDHOOD
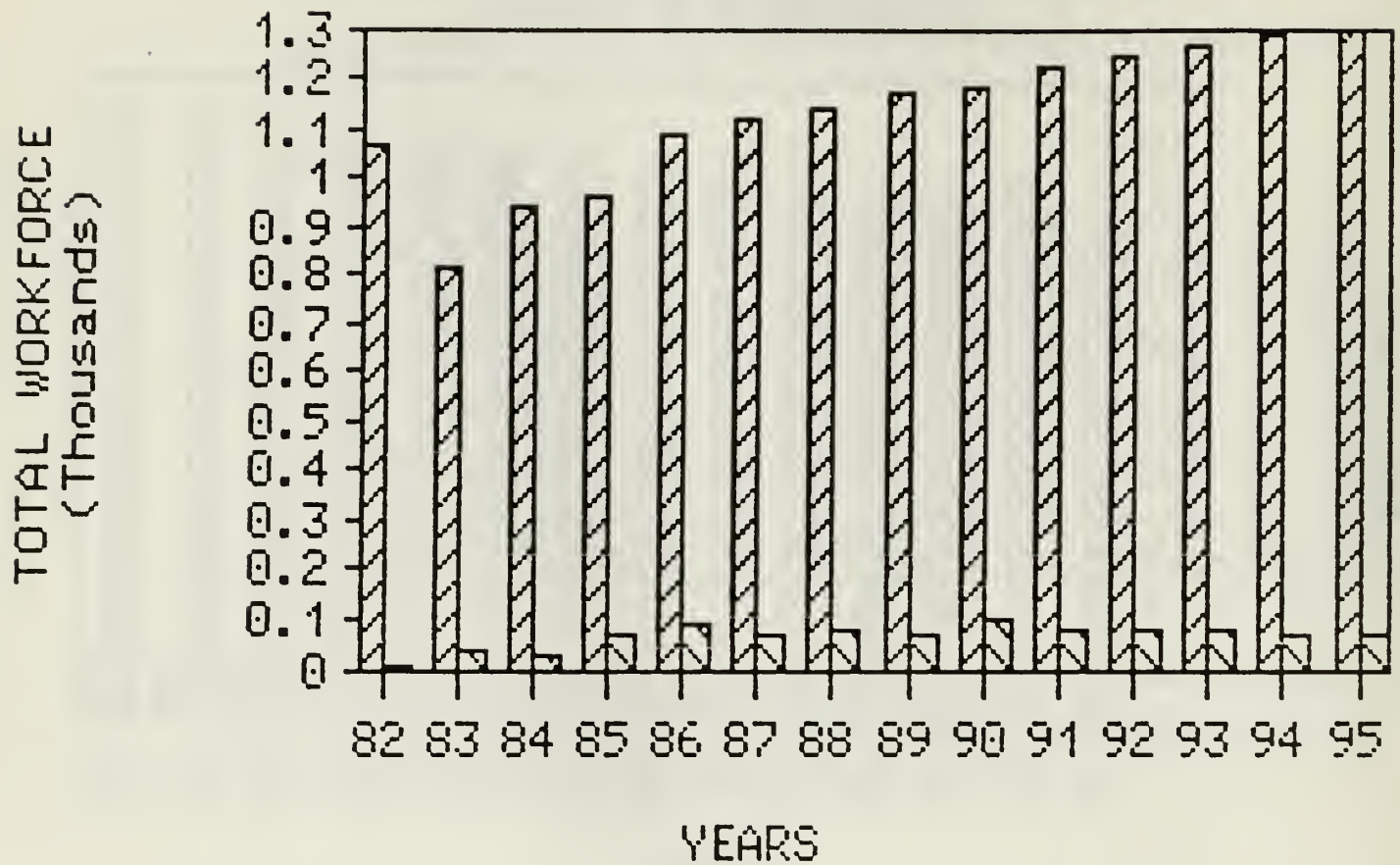
Table 56.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLLED	RESERVE POOL	SURPLUS/ DEFICIT
82	1070	12	876	0.89	0.22	32	2	56801		
83	819	40	1000	0.93	0.18	29	2	57580		
84	948	35	1002	0.95	0.05	29	2	58086		
85	961	75	1130	0.96	0.15	27	2	61396		
86	1086	91	1177	0.96	0.08	27	2	63928		
87	1126	77	1203	0.96	0.06	27	2	65333	398	321
88	1147	88	1235	0.95	0.07	27	2	67077	359	271
89	1177	72	1249	0.95	0.06	27	2	67814	321	249
90	1189	100	1289	0.95	0.08	27	2	70001	288	189
91	1227	86	1312	0.95	0.07	27	2	71280	256	170
92	1249	85	1334	0.95	0.06	27	2	72446	241	156
93	1269	82	1352	0.95	0.06	27	2	73409	227	145
94	1286	77	1363	0.95	0.06	27	2	74045	210	133
95	1298	76	1374	0.95	0.06	27	2	74618	198	121

Figure 89.

HIRING AND RETENTION 1982 TO 1995
SPECIAL EDUCATION
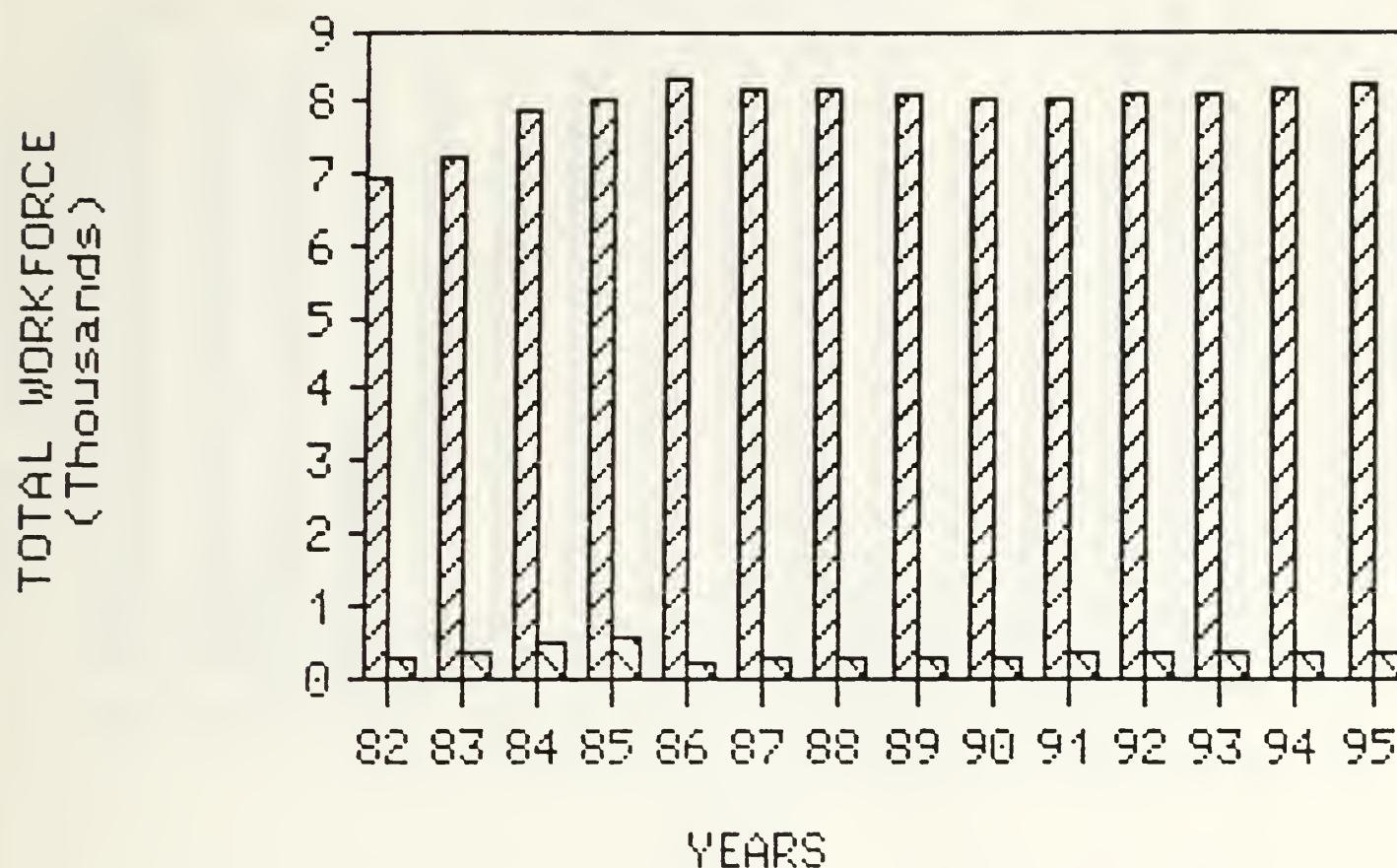
Table 55.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLED	RESERVE POOL	SURPLUS/ DEFICIT
82	6933	326	7779	0.88	0.11	16	1	123973		
83	7244	388	8341	0.93	0.13	14	1	118995		
84	7894	487	8503	0.95	0.07	14	1	114977		
85	8059	613	8625	0.95	0.07	13	1	112847		
86	8366	188	8554	0.97	0.02	13	1	111882		
87	8183	321	8504	0.96	0.04	13	1	111234	437	116
88	8166	290	8456	0.96	0.03	13	1	110601	428	138
89	8123	262	8384	0.96	0.03	13	1	109669	332	130
90	8059	325	8384	0.96	0.04	13	1	109664	382	56
91	8060	366	8425	0.96	0.04	13	1	110508	366	0
92	8099	374	8473	0.96	0.04	13	1	112147	374	0
93	8146	382	8528	0.96	0.04	13	1	114154	382	0
94	8199	389	8588	0.96	0.05	14	1	116359	389	0
95	8259	396	8655	0.96	0.05	14	1	118636	396	0

Figure 88.

HIRING AND RETENTION 1982 TO 1995
BILINGUAL
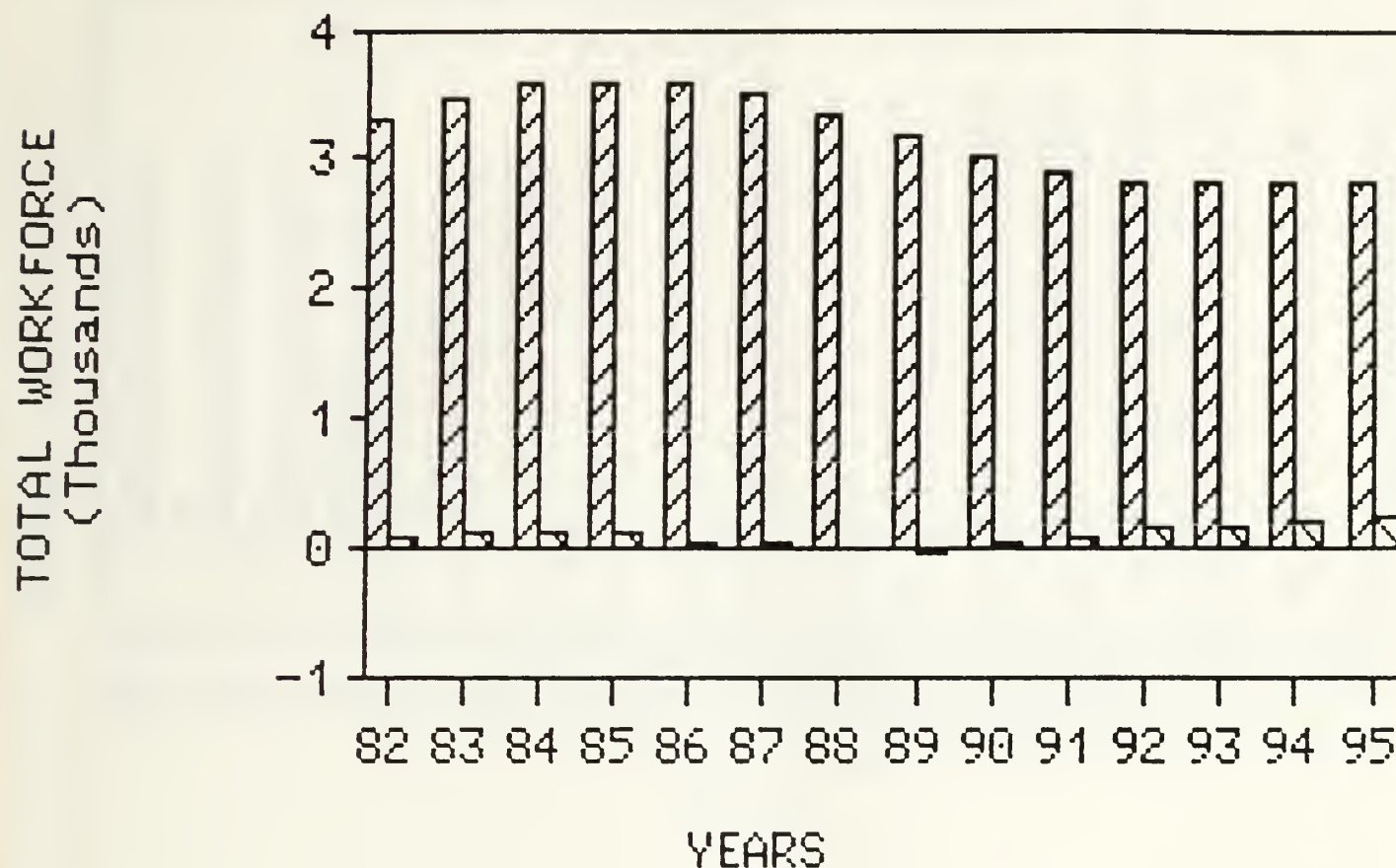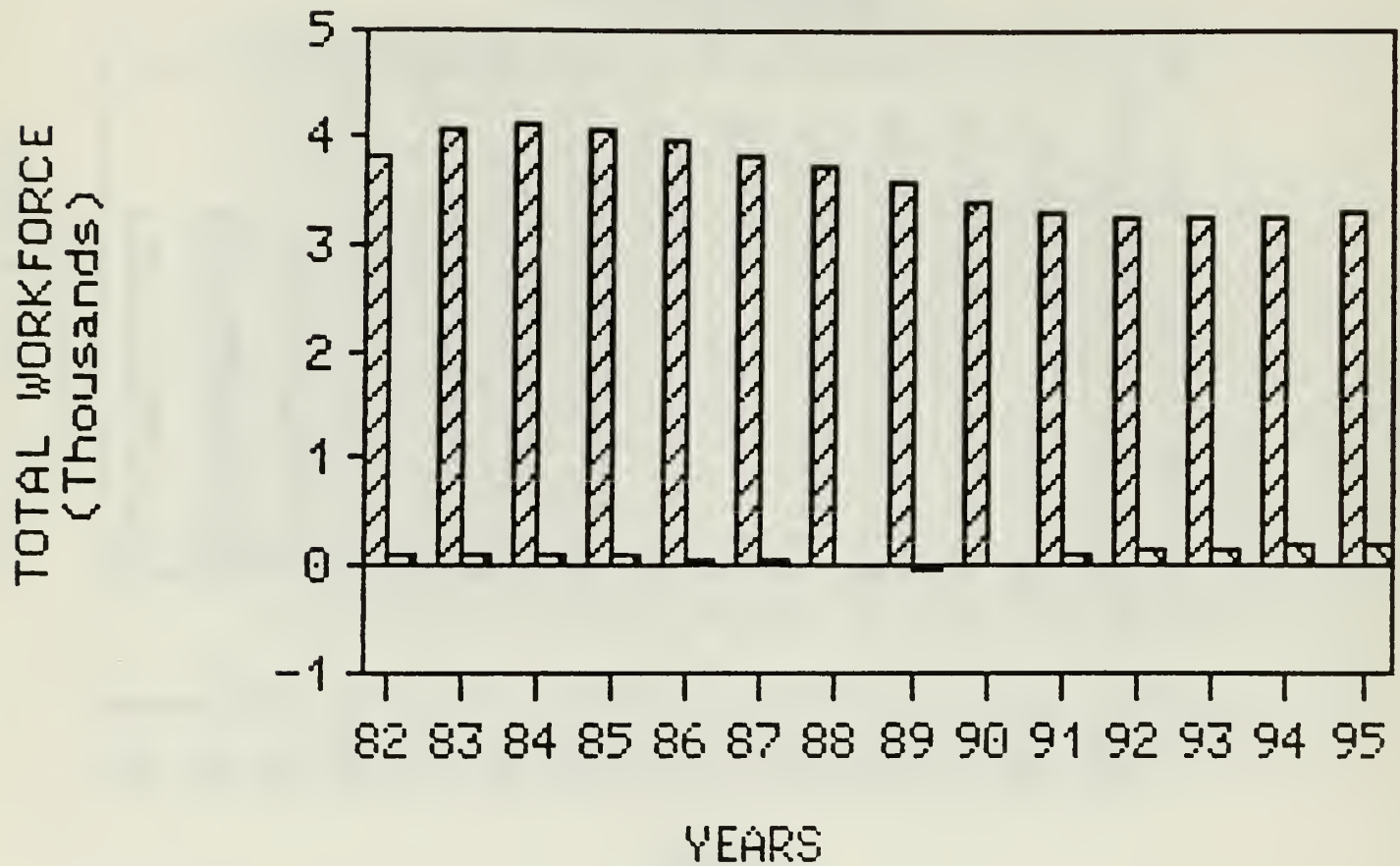

YEARS
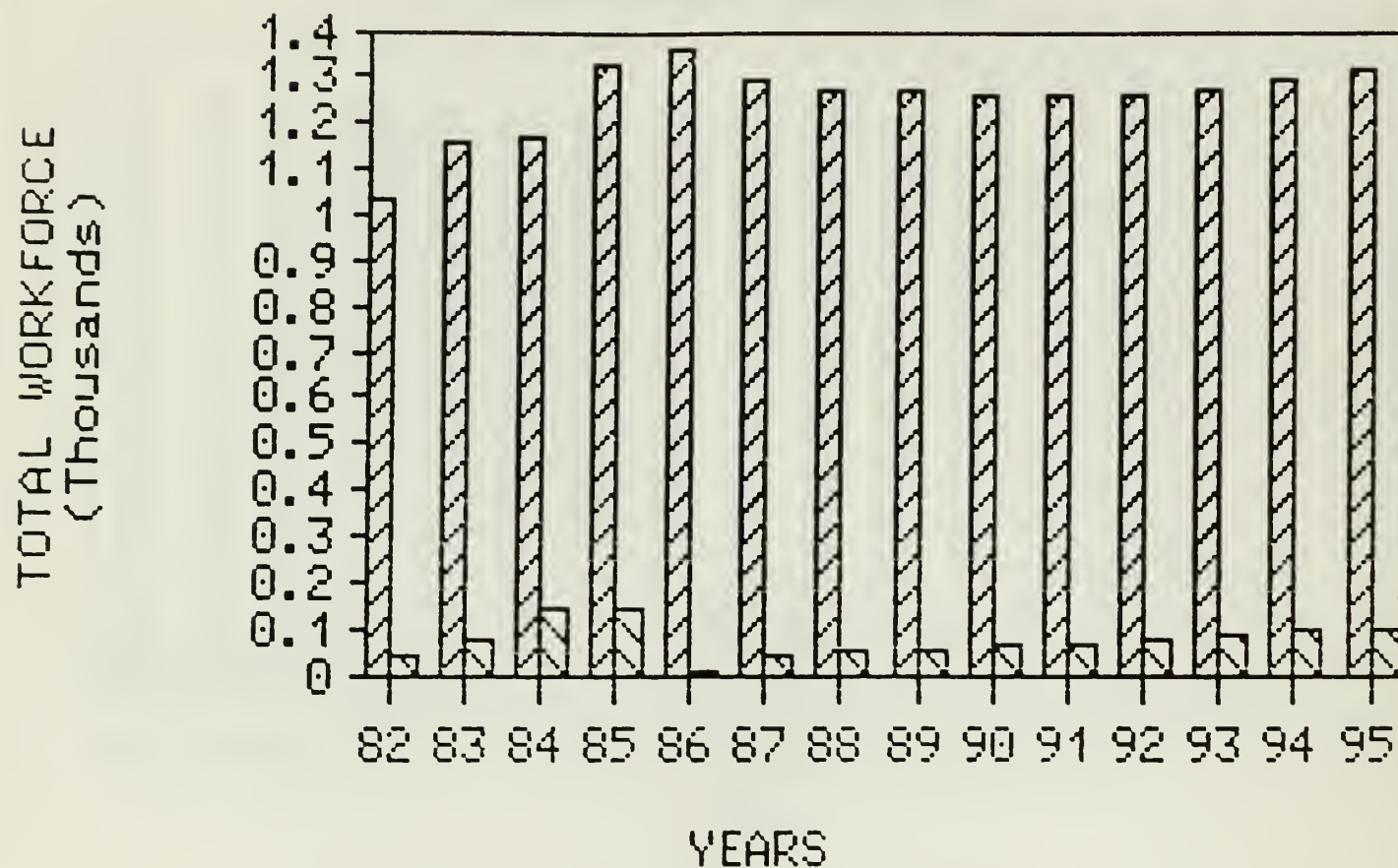
Table 54

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLLED	RESERVE POOL	SURPLUS/ DEFICIT
82	1042	46	1287	0.82	0.19	13	4	71414		
83	1163	79	1238	0.9	0.06	13	4	68597		
84	1171	148	1413	0.95	0.17	11	4	66280		
85	1332	148	1414	0.94	0.06	10	4	64929		
86	1367	6	1373	0.97	0	12	4	64258		
87	1296	49	1345	0.94	0.04	12	4	63737	49	0
88	1281	58	1339	0.95	0.04	12	4	63197	58	0
89	1273	55	1328	0.95	0.04	12	4	62469	55	0
90	1263	64	1327	0.95	0.05	12	4	62324	64	0
91	1261	72	1333	0.95	0.05	12	4	62729	72	0
92	1266	81	1347	0.95	0.06	12	4	63605	81	0
93	1278	88	1366	0.95	0.06	12	4	64734	88	0
94	1295	96	1390	0.95	0.07	12	4	66002	96	0
95	1317	104	1421	0.95	0.07	12	4	67325	104	0

Figure 87.

HIRING AND RETENTION 1982 TO 1995
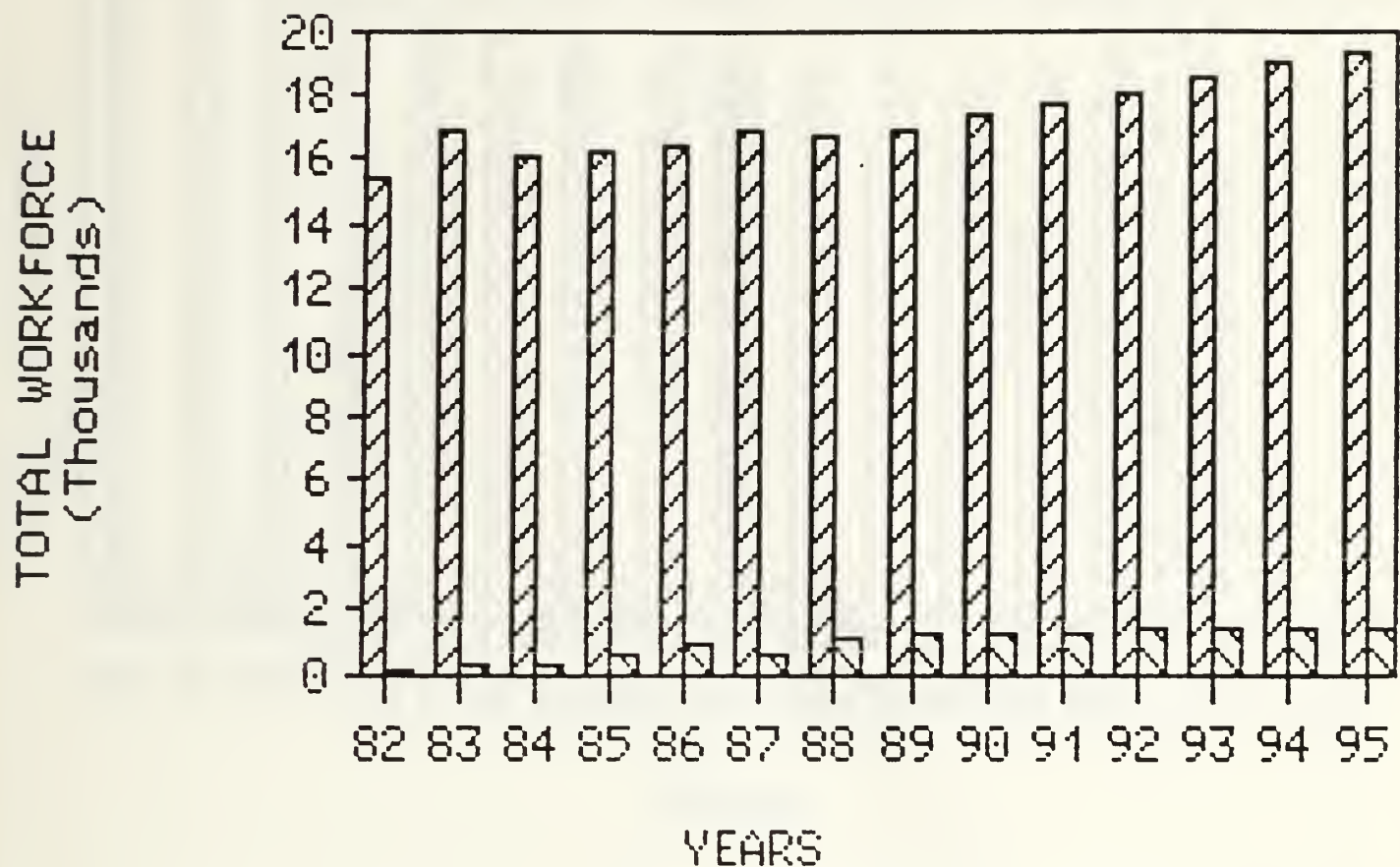## MEDIA & LIBRARY
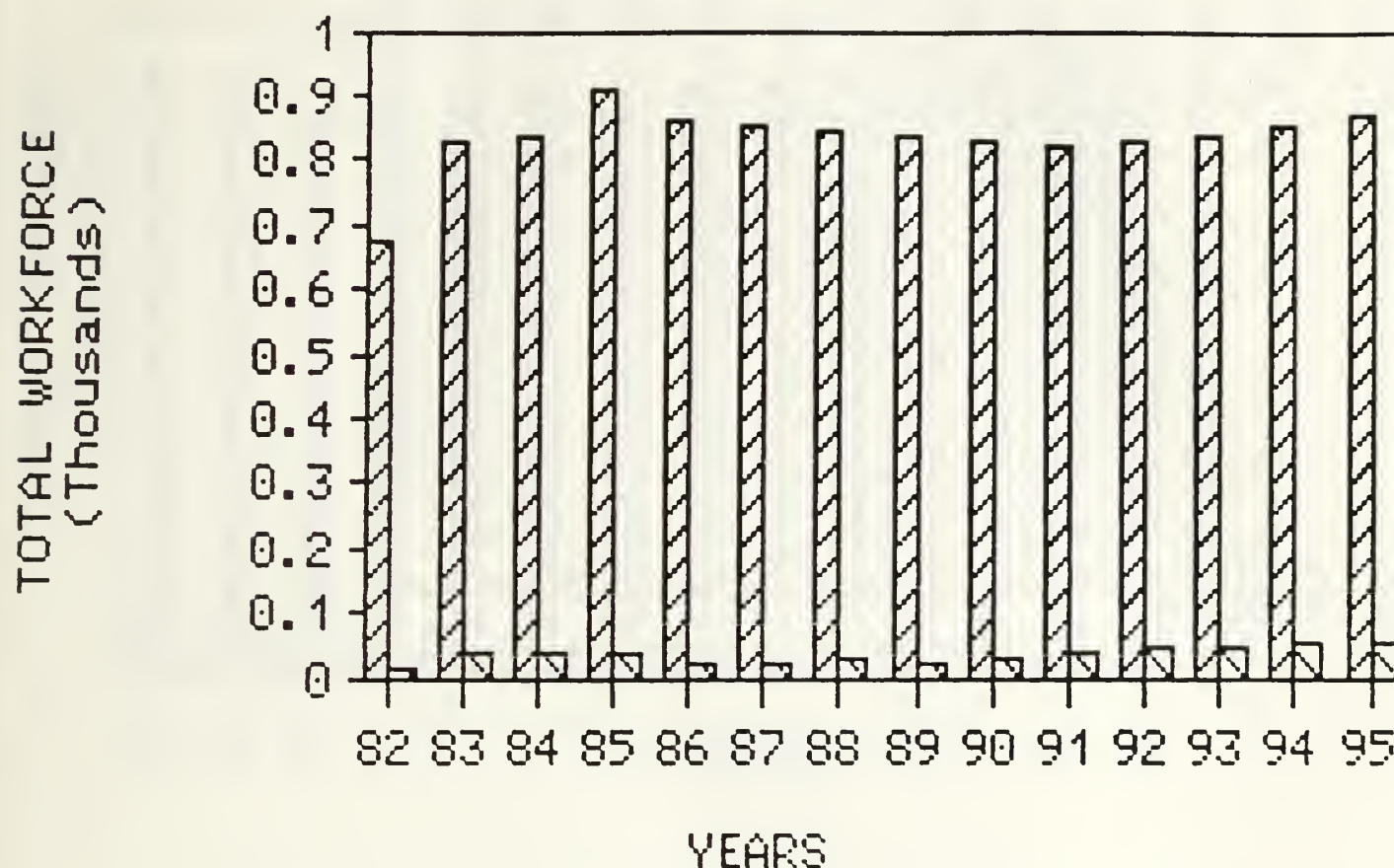
Table 53.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLLED	RESERVE POOL	SURPLUS/ DEFICIT
82	674	18	887	0.76	0.24	1045	1	927454		
83	830	39	885	0.94	0.06	1006	1	890876		
84	839	38	957	0.95	0.12	899	1	860780		
85	915	44	896	0.96	0.02	941	1	843240		
86	860	27	887	0.96	0.03	941	1	834516		
87	853	27	880	0.96	0.03	941	1	827753	45	18
88	843	30	872	0.96	0.03	941	1	820742	57	28
89	836	26	862	0.96	0.03	941	1	811288	60	34
90	827	33	860	0.96	0.04	941	1	809402	63	30
91	825	41	866	0.96	0.05	941	1	814667	67	26
92	830	48	878	0.96	0.05	941	1	826034	73	25
93	841	52	893	0.96	0.06	941	1	840696	79	27
94	856	55	911	0.96	0.06	941	1	857167	87	31
95	872	57	929	0.96	0.06	941	1	874357	94	37

Figure 86.

HIRING AND RETENTION 1982 TO 1995
COUNSELING
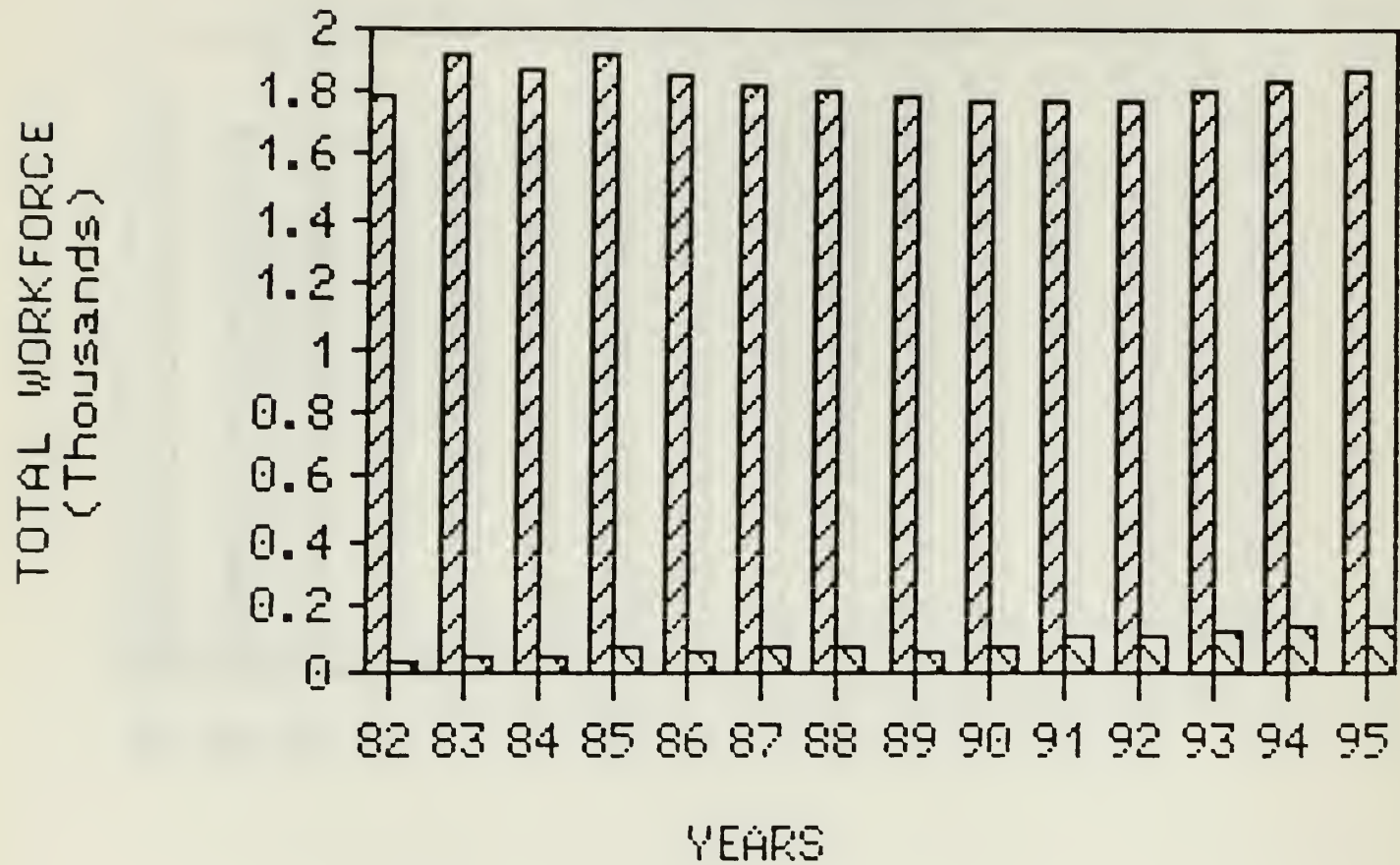
Table 52.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLLED	RESERVE POOL	SURPLUS/ DEFICIT
82	1786	32	2044	0.84	0.13	454	1	927454		
83	1921	42	1937	0.94	0.01	460	1	890876		
84	1867	56	2006	0.96	0.07	429	1	860780		
85	1919	77	1938	0.96	0.01	435	1	843240		
86	1861	58	1919	0.96	0.03	435	1	834516		
87	1824	79	1903	0.95	0.04	435	1	827753	141	62
88	1810	77	1887	0.95	0.04	435	1	820742	144	67
89	1794	71	1865	0.95	0.04	435	1	811288	145	74
90	1773	88	1861	0.95	0.05	435	1	809402	147	59
91	1768	105	1873	0.95	0.06	435	1	814667	146	41
92	1779	120	1899	0.95	0.06	435	1	826034	152	32
93	1802	131	1933	0.95	0.07	435	1	840696	161	30
94	1832	138	1971	0.95	0.07	435	1	857167	172	34
95	1867	143	2010	0.95	0.07	435	1	874357	186	42

Figure 85.

HIRING AND RETENTION 1982 TO 1995
ADMINISTRATORS

TOTAL WORKFORCE (Thousands)

YEARS
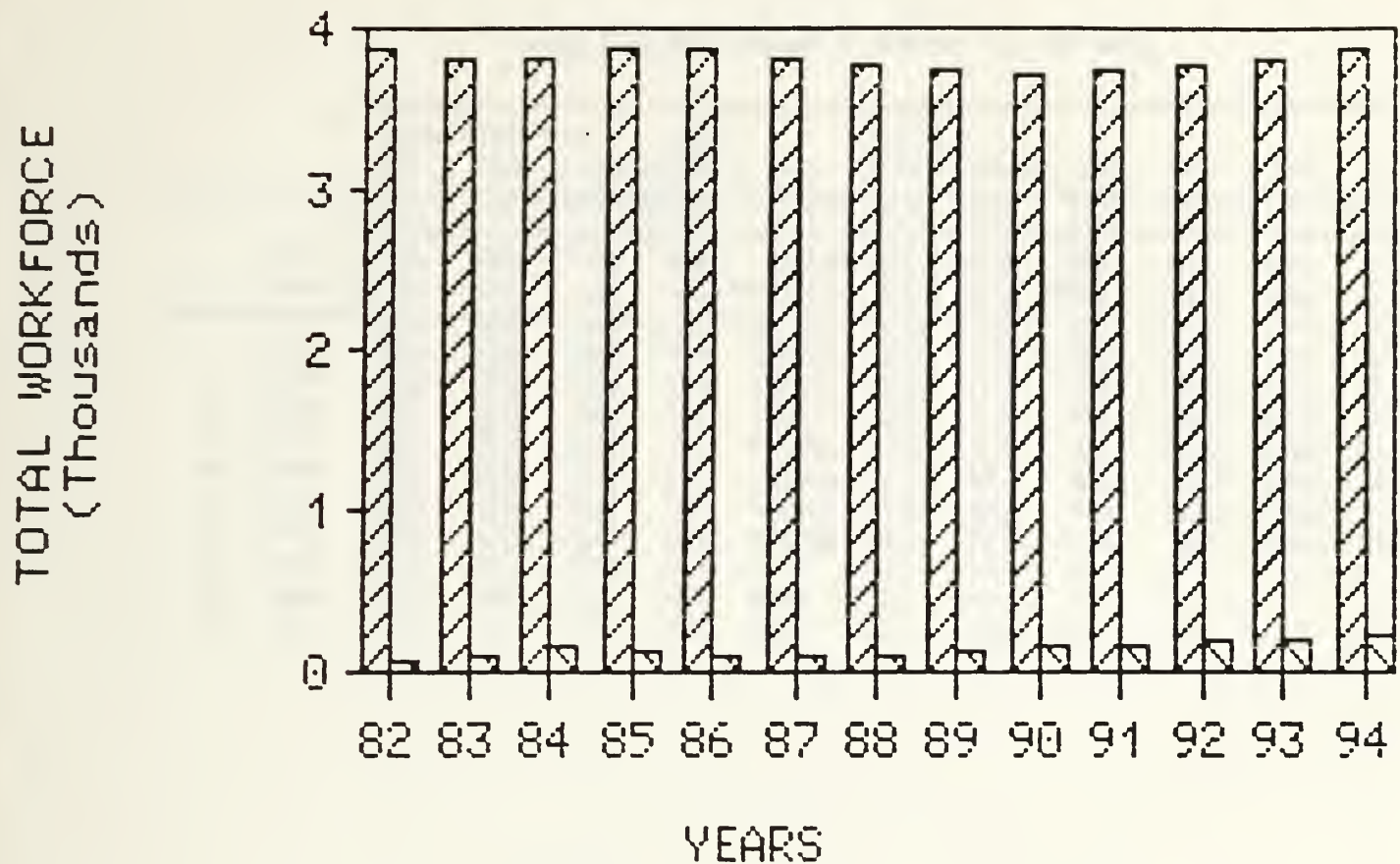
Table 51.

YEAR	RETAINED	HIRED	TOTAL WORKFORCE	RETENTION RATE	PERCENT HIRED	STUDENTS/ TEACHER	CLASSES/ TIME	ENROLLED	RESERVE POOL	SURPLUS/ DEFICIT
83	3880	79	3994	0.94	0.03	223	1	890876		
84	3808	99	3978	0.95	0.04	216	1	860780		
85	3799	166	4023	0.96	0.06	210	1	843240		
86	3858	123	3982	0.96	0.03	210	1	834516		
87	3869	81	3949	0.97	0.02	210	1	827753	141	60
88	3804	112	3916	0.96	0.03	210	1	820742	161	50
89	3774	97	3871	0.96	0.03	210	1	811288	153	56
90	3733	129	3862	0.96	0.03	210	1	809402	153	24
91	3725	157	3882	0.96	0.04	210	1	814667	157	0
92	3744	170	3914	0.96	0.04	211	1	826034	170	0
93	3775	185	3959	0.96	0.05	212	1	840696	185	0
94	3818	198	4015	0.96	0.05	213	1	857167	198	0
95	3871	213	4084	0.96	0.05	214	1	874357	213	0

Table 49.

SIMULATION #3:   DECREASE IN ENROLLMENT/EMPLOYMENT RATIO

YEAR	TOTAL EMPLOYED	TOTAL RETAINED	TOTAL HIRED	AVERAGE AGE	STUDENT TEACHER RATIO	TOTAL ENROLLED	TOTAL RESERVE POOL	STOPOUTS RETURNING	PAST CERTS AVAIL.	HIRED NO CERT
86	61679	57731	3948	42.36	13.53	834516	4170	1172	2474	524
87	61635	57624	4011	42.75	13.43	827753	4936	1138	2887	912
88	61571	57610	3961	43.11	13.33	820742	5201	1109	2998	1095
89	61322	57565	3757	43.48	13.23	811288	5337	1089	3030	1218
90	61645	57363	4282	43.73	13.13	809402	5412	1067	3033	1312
91	62522	57654	4869	43.89	13.03	814667	5738	1052	3225	1462
92	63885	58452	5433	43.97	12.93	826034	6178	1016	3519	1644
93	65526	59713	5813	44.02	12.83	840696	6689	1015	3839	1835
94	67334	61227	6107	44.06	12.73	857167	7198	1029	4154	2015
95	69229	62898	6330	44.09	12.63	874357	7513	1045	4290	2179

Table 50.

SIMULATION #4:   INCREASE IN THE ENROLLMENT/EMPLOYMENT RATIO

YEAR	TOTAL EMPLOYED	TOTAL RETAINED	TOTAL HIRED	AVERAGE AGE	STUDENT TEACHER RATIO	TOTAL ENROLLED	TOTAL RESERVE POOL	STOPOUTS RETURNING	PAST CERTS AVAIL.	HIRED NO CERT
86	60780	57731	3050	42.47	13.73	834516	4170	1172	2474	524
87	59852	56804	3048	42.96	13.83	827753	4689	1138	2711	840
88	58919	55976	2943	43.43	13.93	820742	4672	1099	2632	941
89	57825	55125	2700	43.89	14.03	811288	4644	1067	2560	1017
90	57283	54137	3146	44.24	14.13	809402	4587	1032	2483	1072
91	57250	53617	3633	44.47	14.23	814667	4772	1004	2587	1181
92	57644	53564	4080	44.62	14.33	826034	5039	955	2770	1314
93	58260	53917	4343	44.72	14.43	840696	5376	940	2981	1455
94	58993	54470	4523	44.81	14.53	857167	5712	940	3188	1584
95	59765	55130	4635	44.9	14.63	874357	5854	941	3215	1698

Table 47.

SIMULATION #1:   AGING

YEAR	TOTAL EMPLOYED	TOTAL RETAINED	TOTAL HIRED	AVERAGE AGE	STUDENT TEACHER RATIO	TOTAL ENROLLED	TOTAL RESERVE POOL	STOPOUTS RETURNING	PAST CERTS AVAIL.	HIRED NO CERT
86	61734	57768	3966	42.35	13.66	843240	4182	1172	2483	527
87	61640	57674	3966	42.75	13.68	843240	4953	1138	2899	917
88	61581	57615	3966	43.11	13.69	843240	5200	1110	2996	1094
89	61538	57572	3966	43.44	13.7	843240	5332	1089	3026	1217
90	61524	57558	3966	43.75	13.71	843240	5471	1067	3075	1329
91	61507	57541	3966	44.03	13.71	843240	5716	1055	3206	1456
92	61487	57521	3966	44.29	13.71	843240	5870	1016	3299	1554
93	61478	57512	3966	44.54	13.72	843240	5997	1004	3358	1634
94	61468	57502	3966	44.77	13.72	843240	6117	1000	3415	1702
95	61451	57485	3966	44.99	13.72	843240	6066	993	3314	1759

Table 48.

SIMULATION #2:   ENROLLMENT/EMPLOYMENT RATIO CONSTANT

YEAR	TOTAL EMPLOYED	TOTAL RETAINED	TOTAL HIRED	AVERAGE AGE	STUDENT TEACHER RATIO	TOTAL ENROLLED	TOTAL RESERVE POOL	STOPOUTS RETURNING	PAST CERTS AVAIL.	HIRED NO CERT
86	61226	57731	3496	42.41	13.63	834516	4170	1172	2474	524
87	60730	57211	3519	42.86	13.63	827753	4812	1138	2798	876
88	60216	56781	3435	43.27	13.63	820742	4933	1104	2812	1017
89	59522	56318	3204	43.68	13.63	811288	4982	1078	2789	1115
90	59384	55703	3681	43.99	13.63	809402	4986	1049	2749	1188
91	59770	55562	4208	44.18	13.63	814667	5235	1027	2892	1316
92	60604	55901	4703	44.29	13.63	826034	5580	984	3126	1470
93	61680	56667	5013	44.38	13.63	840696	5995	976	3385	1634
94	62888	57651	5237	44.44	13.63	857167	6406	982	3638	1785
95	64149	58759	5390	44.5	13.63	874357	6622	990	3712	1920

Table 46.

WAVIERS OF CERTIFICATION

CERTIFICATION	CERT #	NUMBER WAIVED	1987 BILINGUAL NUMBER WAIVED	1986 NUMBER WAIVED	1986 BILINGUAL NUMBER WAIVED
YNG CHILDREN/SPEC NEEDS	2	8	0	4	0
EARLY CHILDHOOD	3	0	5	3	12
ELEMENTARY	4	8	50	9	74
MIDDLE SCHOOL	5	0	1	0	4
ENGLISH/SCND LANG	10	5	0	14	0
ENGLISH	11	5	1	1	0
HISTORY	12	2	1	2	1
SOCIAL STUDIES	14	3	9	1	15
MATH	15	18	13	22	10
CHEMISTRY	16	0	0	2	1
PHYSICS	17	1	1	6	0
BIOLOGY	18	3	3	2	1
GENERAL SCIENCE	19	3	6	5	11
FRENCH	21	2	0	1	0
GERMAN	22	1	0	2	0
SPANISH	23	7	1	8	2
ITLAIAN	24	1	0	0	0
PORTUGESE	27	2	2	0	1
OTHER FOREIGN LANG.	28	1	0	0	0
LATIN & CLASSICS	31	1	0	1	0
MATH AND SCIENCE	32	1	1	2	1
PHYSICAL ED.	40	1	1	0	0
HEALTH	42	2	0	0	0
BUSINESS	43	2	0	1	2
INDUSTRIAL ARTS	45	6	0	4	0
READING	46	17	0	24	0
ART	47	6	1	2	0
MUSIC	48	1	0	7	0
HEARING/LANG. DIS.	57	7	0	3	0
UNIFIED MEDIA SPEC.	74	6	0	4	0
SCHOOL PSYCHOLOGIST	75	3	0	2	0
GUIDANCE COUNSELOR	76	10	0	7	0
PRINCIPAL	79	2	0	0	0
SUPERVISOR/DIRECTOR	81	2	0	2	0

Table 45.

YEAR	NEWLY HIRED	CERT BEFORE HIRED	CERT AT HIRING	CERT AFTER HIRING	NEVER CERT
1973	7133	1559	1572	571	3431
1974	5964	1914	1456	461	2133
1975	4612	1899	932	399	1382
1976	4126	2077	831	257	961
1977	3763	2134	701	213	715
1978	3708	1991	745	183	789
1979	3082	1674	669	201	538
1980	2835	1514	679	221	421
1981	1548	972	254	193	129
1982	1534	826	226	65	417
1983	2382	1295	288	140	659
1984	2311	1158	392	201	560
1985	2154	1190	559	164	241

Table 43

AVERAGE AGE OF STOPOUTS

YEAR	AVERAGE AGE
1973	31
1974	30
1975	31
1976	31
1977	31
1978	33
1979	33
1980	34
1981	34
1982	35
1983	37
1984	37

Table 44

YEAR	COMPUTERIZED RECORD OF CERTIFICATION	PERCENT	NO COMPUTER RECORD OF CERTIFICATION	PERCENT
1974	30643	0.42	41121	0.57
1975	33923	0.46	38718	0.53
1976	36748	0.50	36020	0.49
1977	38618	0.52	34941	0.47
1978	39179	0.53	33645	0.46
1979	39467	0.54	32422	0.45
1980	39442	0.55	31226	0.44
1981	35335	0.55	28678	0.44
1982	35231	0.56	27681	0.43
1983	35527	0.56	27020	0.43
1984	36092	0.57	26568	0.42
1985	36464	0.58	25761	0.41

Table 41

ENTRANTS: NEWLY HIRED AND STOPOUTS RETURNING, 1974 TO 1985

YEAR	ENTRANTS	NEWLY HIRED	STOPOUTS	STOPOUTS AS A FRACTION OF ENTRANTS
1974	7589	5964	1625	0.21
1975	6198	4612	1586	0.25
1976	5482	4126	1356	0.24
1977	5766	3763	2003	0.34
1978	5249	3708	1541	0.29
1979	4909	3082	1827	0.37
1980	4453	2835	1618	0.36
1981	2890	1548	1342	0.46
1982	4197	1534	2663	0.63
1983	3874	2382	1492	0.38
1984	4213	2311	1902	0.45

Table 42

AGE DISTRIBUTION OF TOTAL STOPOUTS BY YEAR
===
1973-1984

AGE	73	74	75	76	77	78	79	80	81	82	83	84
20-24	152	168	111	98	77	68	44	31	76	19	12	8
25-29	554	655	538	602	448	592	345	282	567	243	108	57
30-34	204	266	234	329	308	541	418	428	678	475	309	169
35-39	79	98	103	98	110	214	160	163	386	256	246	182
40-44	33	46	46	59	38	86	79	66	220	112	102	61
45-49	30	35	36	41	34	69	51	70	90	72	57	39
50-54	20	19	22	25	18	50	31	36	68	52	29	19
55-59	13	11	13	14	10	26	26	18	22	22	24	14
60-64	19	12	10	3	0	10	3	3	7	6	1	3
65+	20	9	10	10	7	12	4	3	18	12	14	9

Figure 84.

Percent of Those Who Left the Workforce Returning, by Duration
Years 1974 to 1984

Duration of Years Before Returning to the Workforce
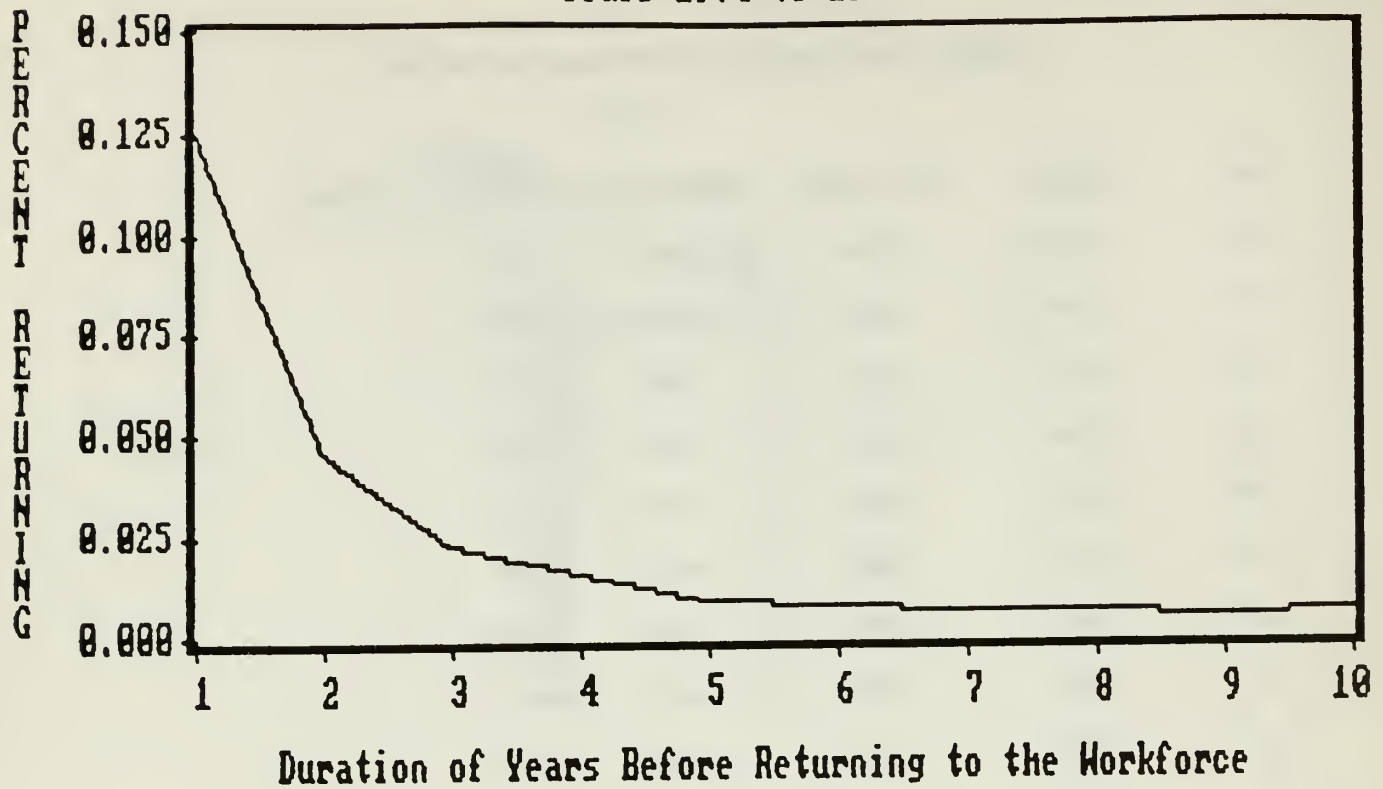
Table 39

ESTIMATED PERCENT RETURNING
FROM ATTRITION OVER TIME

YEARS AFTER LEAVE	PERCENT WHO RETURN
1	12.5
2	7.1
3	4.6
4	2.3
5	1.6
6	0.9
7	0.9
8	0.7
9	0.7
10	0.6
11	0.7

Table 40

RESERVE POOL FROM ATTRITION

YEAR	POOL
1987	649
1988	439
1989	329
1990	252
1991	200
1992	157
1993	93
1994	55
1995	29

Table 37

AGE OF PAST CERTIFICATION HOLDERS HIRED

	YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12
H	1973	25												
I	1974	25	26											
R	1975	25	26	28										
I	1976	25	26	28	28									
N	1977	26	27	27	28	30								
G	1978	27	27	27	29	30	31							
	1979	27	28	28	29	31	31	35						
Y	1980	28	28	28	29	30	31	32	33					
E	1981	28	27	28	29	30	31	31	34	34				
A	1982	29	30	29	31	31	30	33	33	32	36			
R	1983	28	29	29	31	31	33	32	33	34	35	35		
	1984	26	28	30	30	32	31	32	33	35	35	37	35	
	1985	29	27	30	31	31	31	33	34	35	34	36	35	38

YEARS CERTIFIED PREVIOUS TO HIRING

Table 38

TOTAL ATTRITION & NUMBER RETURNING

YEAR	TOTAL ATTRITION	NUMBER TO RETURN	PERCENT RETURNING
1973	5404	1124	NA
1974	6480	1329	20.8
1975	5450	1123	20.6
1976	5401	1279	23.8
1977	5011	1050	21.0
1978	6018	1668	27.7
1979	5853	1161	19.8
1980	5702	1102	19.3
1981	9466	2132	22.5
1982	5330	1267	23.8
1983	4327	902	20.8
1984	4187	561	13.4

Figure 83.

Percent First Hired by Number of Years after First
Certification: 1972 to 1985

Number of Years after First Certification
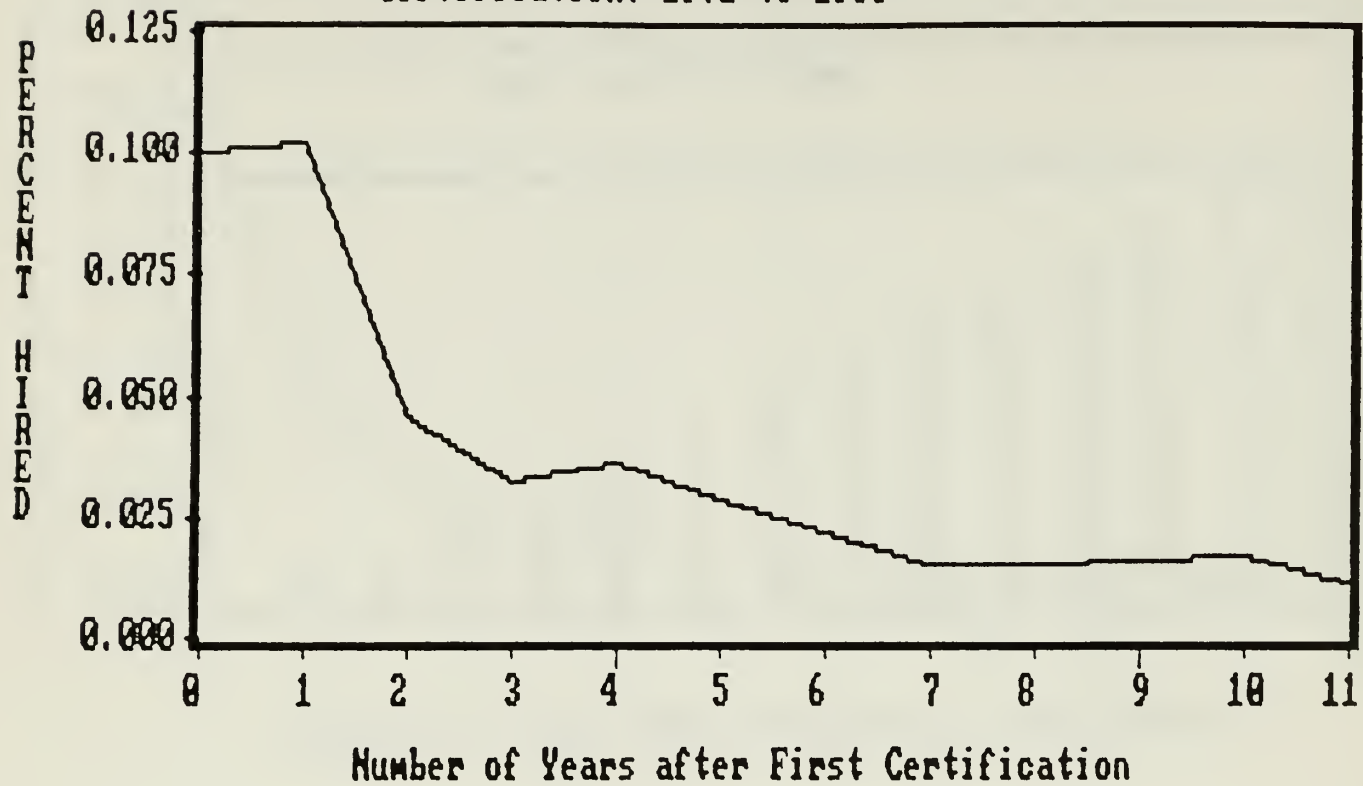
Table 35

PERCENT HIRED FROM A GIVEN
CERTIFICATION YEAR

YEARS AFTER CERTIFICATION	PERCENT CERTIFIED IN YEAR 0 SUBSEQUENTLY HIRED
0	10.05
1	10.16
2	4.61
3	3.19
4	3.19
5	3.66
6	2.83
7	2.22
8	1.86
9	1.56
10	1.56
11	1.64
12	1.75
13	1.17

Table 36

POOL OF PAST
CERTIFICATE HOLDERS
AVAILABLE IN THE
FORECAST PERIOD

YEAR	POOL
1987	1714
1988	1353
1989	1098
1990	884
1991	689
1992	540
1993	417
1994	306
1995	221

Table 33

PERCENT OF PAST CERTIFICATE RECIPIENTS HIRED

YEAR	NEWLY HIRED	CERT BEFORE HIRED	PERCENT PAST CERTS HIRED
1973	7133	1559	21.85
1974	5964	1914	32.09
1975	4612	1899	41.17
1976	4126	2077	50.33
1977	3763	2134	56.71
1978	3708	1991	53.69
1979	3082	1674	54.31
1980	2835	1514	53.40
1981	1548	972	62.79
1982	1534	826	53.84
1983	2382	1295	54.36
1984	2311	1158	50.10
1985	2154	1190	55.24

Table 34

CERTIFICATION TO HIRING BEHAVIOR: 1973 TO 1985

YEARS OF HIRING

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
C 1972	1441	1559	487	212	131	138	87	75	69	29	30	46	28	31
E 1973	246	1572	1427	433	285	179	114	99	78	55	25	67	36	42
R 1974	109	193	1456	1254	586	340	239	164	124	74	62	89	53	48
T 1975	45	71	162	932	1075	539	389	219	141	88	69	96	63	66
1976	27	33	75	108	839	938	520	268	182	122	66	101	76	70
Y 1977	14	19	30	38	85	701	729	333	204	111	67	123	65	58
E 1978	13	14	13	19	31	61	745	516	243	109	78	106	69	56
A 1979	12	10	13	8	14	28	60	669	473	155	98	105	80	64
R 1980	8	9	9	11	14	15	31	117	679	229	140	168	129	104
1981	79	92	75	55	54	57	67	73	128	254	191	181	159	100
1982	12	11	17	6	6	16	11	14	34	37	226	213	159	120
1983	3	0	1	5	4	1	7	8	14	19	101	288	241	155
1984	1	3	1	3	4	3	5	4	10	5	28	129	392	276
1985	2	5	3	4	1	1	0	5	5	4	11	62	148	559

Figure 82.

FIRST CERTIFICATIONS IN 1985

TOTAL BY CATEGORY (Thousands)

CERTIFICATIONS
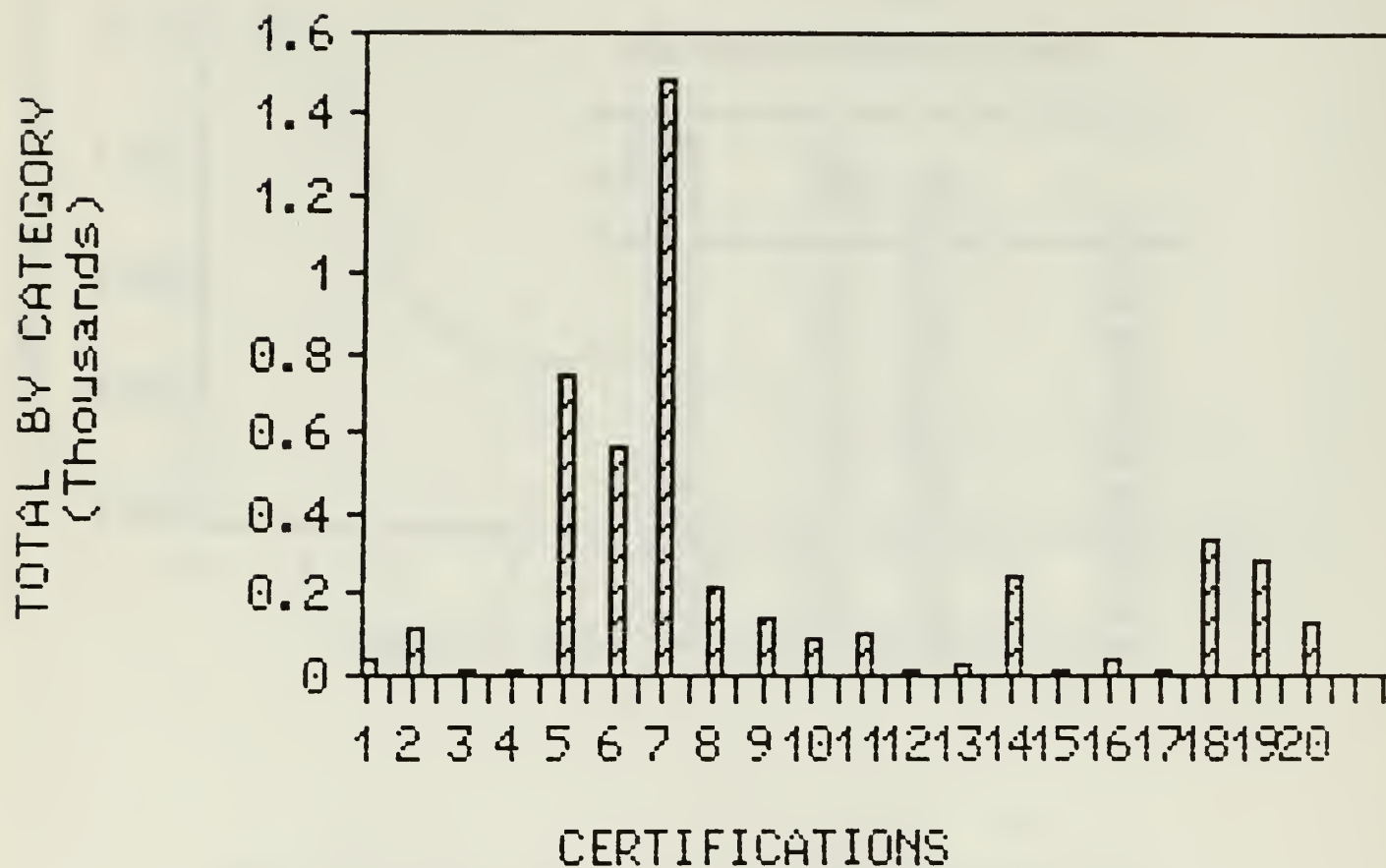
	Table 31			Table 32

1	ADMINISTRATORS	45
2	COUNSELING	111
3	MEDIA/LIBRARIAN	11
4	BILINGUAL	7
5	SPECIAL EDUCATION	753
6	EARLY CHILDHOOD	573
7	ELEMENTARY & MIDDLE	1486
8	ENGLISH	225
9	MATHEMATICS	143
10	GENERAL SCIENCE	93
11	BIOLOGY	99
12	PHYSICS	13
13	CHEMISTRY	27
14	SOCIAL STUDIES	240
15	FRENCH	19
16	SPANISH	33
17	OTHER LANGUAGES	17
18	HEALTH STUDIES	336
19	ART STUDIES	283
20	VOCATIONAL STUDIES	130

AVERAGE AGE OF FIRST CERTIFICATE RECIPIENTS

Year	Age
1973	25
1974	25
1975	25
1976	25
1977	26
1978	27
1979	27
1980	27
1981	28
1982	27
1983	26
1984	28
1985	28

Table 29

MASSACHUSETTS & OUT-OF-STATE
CERTIFICATE RECIPIENTS

YEAR	IN-STATE	OUT-OF-STATE
1980	8555	1381
	(.860)	(.14)
1981	9236	1003
	(.902)	(.098)
1982	6138	846
	(.879)	(.121)

Table 30

1986: CERTIFICATIONS BY STATE

STATE	CERTS
Massachusetts	2065
New York	240
Rhode Island	179
New Hampshire	101
Connecticut	78
Pennsylvania	76
Vermont	68
Ohio	60
Maine	55
Michigan	48
New Jersey	43
California	32
Florida	28
Indiana	22
North Carolina	20
Wisconsin	20
Illinois	15
Virginia	15
Colorado	13
South Carolina	13
Maryland	11
Kansas	10
Washington, D.C.	9
Oklahoma	9
West Virginia	8
Texas	7
Washington	7
Alabama	6
Arizona	6
Minnesota	6
Missouri	6
Utah	5
Georgia	4
Iowa	4
Kentucky	4
Nebraska	3
Oregon	3
Arkansas	2
Delaware	2
North Dakota	2
New Mexico	2
South Dakota	2
Tennessee	2
Hawaii	1
Idaho	1
Louisiana	1
Mississippi	1
Puerto Rico	1

Table 27

FIRST CERTIFICATIONS AND HIRING ACTIVITY
1973 TO 1985

YEAR	TOTAL INDIVIDUALS 1ST CERTS	HIRED BEFORE 1ST CERT	HIRED IN YEAR OF 1ST CERT	1 YEAR	2 YEARS	3 YEARS	4 YEARS	5 YEARS	6-10 YRS	10+ YEARS	YET TO BE HIRED
1973	13144	246	1572	1427	433	285	179	114	324	78	8781
1974	14011	302	1456	1254	586	340	239	164	402	48	9219
1975	11360	278	932	1075	539	389	219	141	382	NA	7405
1976	10255	243	839	938	520	268	182	122	313	NA	6830
1977	7717	186	701	729	333	204	111	67	246	NA	5140
1978	6786	151	745	516	243	109	78	106	125	NA	4711
1979	6142	165	669	473	155	98	105	80	64	NA	4331
1980	6121	214	679	229	140	168	129	104	NA	NA	4310
1981	5836	680	254	191	181	159	100	NA	NA	NA	2336
1982	4000	164	226	213	159	120	NA	NA	NA	NA	3116
1983	3388	163	288	241	155	NA	NA	NA	NA	NA	2540
1984	3365	196	392	276	NA	NA	NA	NA	NA	NA	2500
1985	3848	251	559	4	NA	NA	NA	NA	NA	NA	3034

Table 28

NUMBER OF MPLC GRADUATES, YEARS 1982-1985
==

RECEIVING FIRST CERTIFICATION IN 1985
=======================================

	NUMBER CERTIFIED IN 1985	
YEAR OF GRADUATION	UNADJUSTED	ADJUSTED
1982	19	50
1983	44	54
1984	92	111
1985	975	1 118
TOTAL	1130	1333

Figure 80.

HIGH SCHOOL SENIORS:PUBLIC & NON-PUBLIC
1968 TO 1995
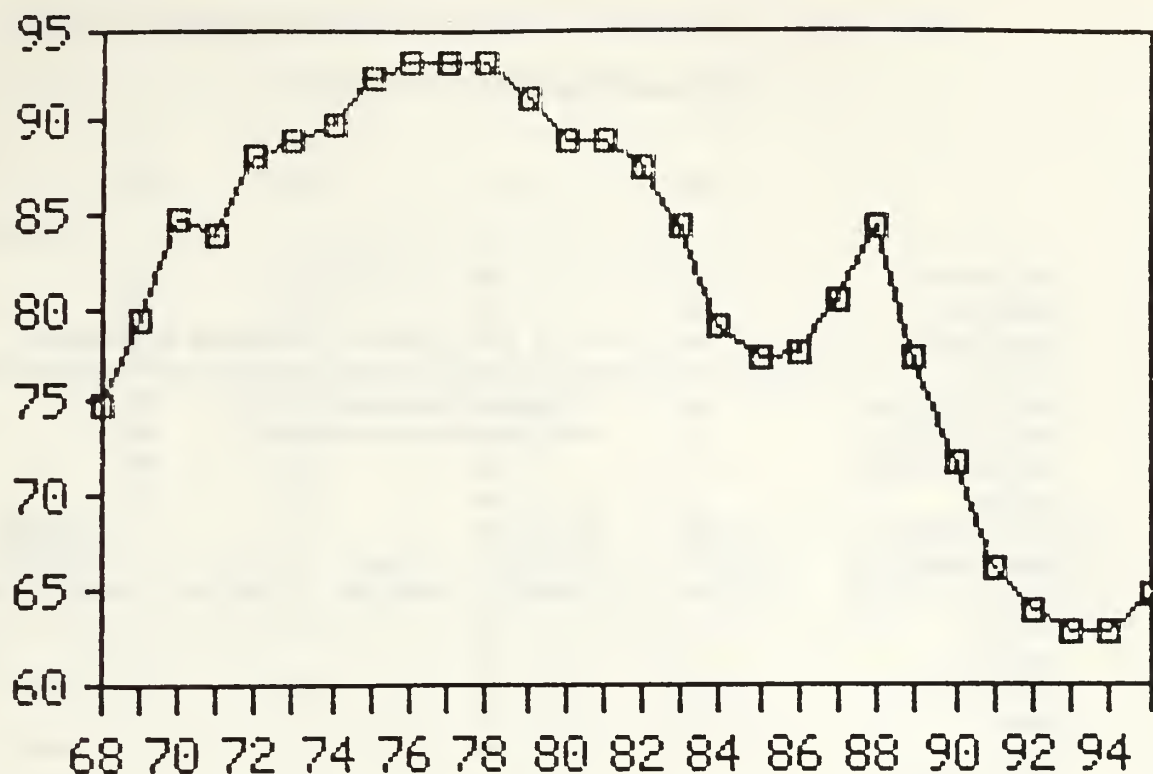
Figure 81.
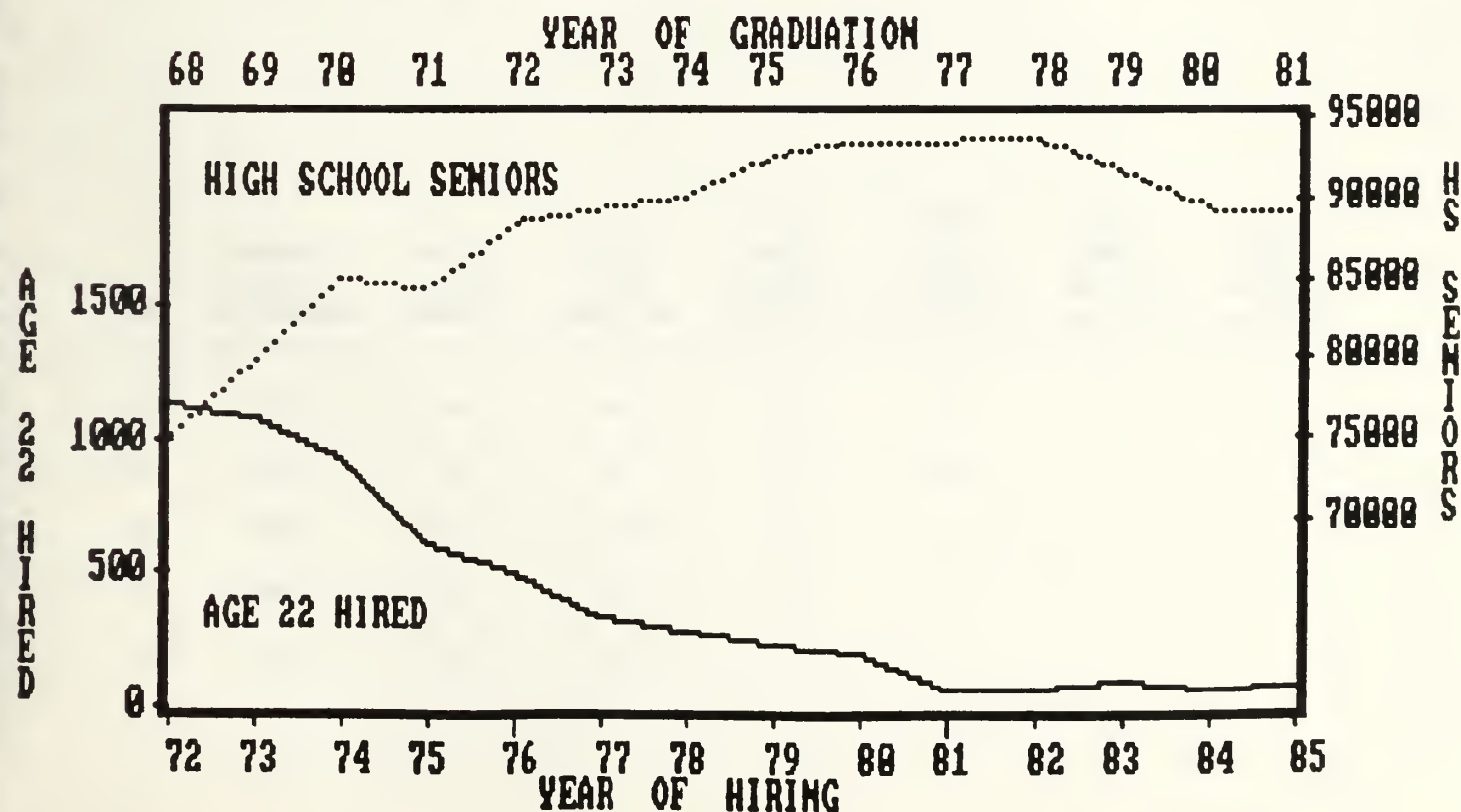
HIGH SCHOOL SENIORS (1968-1981) AND HIRED AGE 22 (1972-1985)

Table 26

CERTIFICATIONS PURSUED BY GRADUATES OF MASSACHUSETTS PROGRAMS LEADING TO CERTIFICATION

TWENTY AGGREGATE CATEGORIES: 1982 TO 1986

	1982	1983	1984	1985	1986
ADMINISTRATOR	61	69	81	78	94
COUNSELING	95	157	122	111	82
MEDIA/LIBRARIAN	48	43	43	71	24
BILINGUAL	34	29	16	32	17
SPECIAL EDUCATION	186	205	187	211	154
EARLY CHILDHOOD	132	277	271	378	337
ELEMENTARY & MIDDLE	471	598	550	559	548
ENGLISH	8	38	40	47	36
MATHEMATICS	16	25	33	34	32
GENERAL SCIENCE	6	40	78	85	30
BIOLOGY	8	20	27	38	18
PHYSICS	0	2	2	4	1
CHEMISTRY	0	4	7	13	7
SOCIAL STUDIES	31	177	175	234	43
FRENCH	2	6	1	4	9
SPANISH	7	12	5	4	1
OTHER LANGUAGES	0	9	12	6	7
HEALTH STUDIES	343	265	218	178	139
ART STUDIES	17	99	106	98	61
VOCATIONAL STUDIES	35	240	192	168	39

Table 25

GRADUATES OF MASSACHUSETTS PROGRAMS LEADING TO CERTIFICATION

DATA ON MASSACHUSETTS RESIDENTS

YEAR	GRADUATES WHO ARE MASS RESIDENTS	PRE-HIRED	HIRED AT GRADUATION	HIRED ONE YEAR AFTER GRADUATION	HIRED TWO YEAR AFTER GRADUATION	HIRED THREE YEAR AFTER GRADUATION	HIRED FOUR YEAR AFTER GRADUATION
1982	1271	157	50	39	26	30	0
1983	2099	175	110	86	54	1	
1984	1921	171	123	80	0		
1985	2246	177	230	2			
1986	1438	152	0				

YEAR	GRADUATES WHO ARE MASS RESIDENTS	CERTIFIED BEFORE GRADUATION	CERTIFIED AFTER GRADUATION	CERTIFIED ONE YEAR AFTER GRADUATION	CERTIFIED TWO YEAR AFTER GRADUATION	CERTIFIED THREE YEAR AFTER GRADUATION	CERTIFIED FOUR YEAR AFTER GRADUATION
1982	1271	240	448	68	22	16	0
1983	2099	292	698	124	38	3	
1984	1921	404	554	75	6		
1985	2246	426	780	31			
1986	1438	335	339				

Table 24

PUBLIC COLLEGES AND UNIVERSITIES: RANKINGS

	GRADUATES			CERTIFICATIONS			HIRED		
	1983	1984	1985	1983	1984	1985	1983	1984	1985
BRIDGEWATER	2	3	3	1	2	3	5	4	3
FITCHBURG	3	4	4	2	3	2	1	1	3
FRAMINGHAM	7	8	9	7	8	8	6	8	8
NORTH ADAMS	9	7	7	8	7	7	9	9	7
SALEM	4	5	5	3	4	4	2	3	4
SOUTHEASTERN MASS	8	8	8	9	10	10	8	6	8
UNIVERSITY OF LOWELL	10	9	10	10	9	9	7	5	6
UNIVERSITY OF MASS/AMHERST	5	2	2	4	1	1	5	3	1
UNIVERSITY OF MASS/BOSTON	11	10	11	11	11	11	10	7	9
WESTFIELD	1	1	1	5	6	6	4	5	5
WORCESTER	6	6	6	6	5	5	3	2	2

NOTE: SPRINGFIELD COLLEGE CHOSE NOT TO PARTICIPATE IN THIS STUDY.

Table 23

Graduates of Massachusetts Programs Leading to Certification

GRADUATES

Year	Percent Public	Percent Private	Ratio:Pub/Priv
1983	59.4	40.6	1.4
1984	58.7	41.3	1.4
1985	56.4	43.6	1.3
1986	54.5	45.5	1.2

OF THOSE CERTIFIED IN MASSACHUSETTS:

Year	Percent Public	Percent Private	Ratio:Pub/Priv
1983	63.6	36.4	1.7
1984	63.6	36.4	1.7
1985	53.7	46.3	1.2
1986	62.8	37.2	1.7

OF THOSE HIRED IN MASSACHUSETSS PUBLIC SCHOOLS:

Year	Percent Public	Percent Private	Ratio:Pub/Priv
1983	62.1	37.9	1.6
1984	65.7	37.9	1.6
1985	59.1	40.9	1.4
1986	69.1	30.9	2.2

See Appendix   for details on missing data

SCHOOL	GRAD	CERTIFICATION BEHAVIOR: WHEN CERTIFIED						HIRING BEHAVIOR: WHEN HIRED					TOTALS BY SCHOOLS		
		-	0	+1	+2	+3	+4	-	0	+1	+2	+3	GRADS	CERTS	HIRED
BRIDGEWATER	1982	0	140	15	8	4	0	1	15	11	5	8	202	167	40
	1983	18	120	20	3	0	0	0	8	18	6	0	188	161	32
	1984	18	107	12	0	0	0	3	14	20	0	0	171	137	37
	1985	12	121	2	0	0	0	0	32	1	0	0	164	135	33
	1986	26	62	0	0	0	0	2	0	0	0	0	169	88	2
FITCHBURG	1983	35	112	6	1	0	0	4	34	14	7	0	178	154	59
	1984	98	30	3	0	0	0	12	32	11	0	0	144	131	55
	1985	32	114	1	0	0	0	6	27	0	0	0	162	147	33
	1986	29	95	0	0	0	0	3	0	0	0	0	143	124	3
FRAMINGHAM	1983	0	45	10	3	0	0	1	7	4	1	0	83	58	13
	1984	0	23	7	0	0	0	0	3	0	0	0	43	30	3
	1985	4	26	3	0	0	0	0	3	0	0	0	38	33	3
NORTH ADAMS	1983	1	28	1	0	0	0	0	2	1	0	0	33	30	3
	1984	39	3	1	0	0	0	0	2	0	0	0	51	43	2
	1985	5	33	1	0	0	0	0	4	0	0	0	46	39	4
	1986	14	24	0	0	0	0	0	0	0	0	0	47	38	0
SALEM	1982	70	74	22	6	2	0	51	12	3	2	7	227	174	75
	1983	46	47	19	3	1	0	38	4	4	6	0	160	116	52
	1984	44	60	9	1	0	0	28	6	7	0	0	138	114	41
	1985	29	52	3	0	0	0	18	6	0	0	0	127	84	24
	1986	38	13	0	0	0	0	25	0	0	0	0	142	51	25
SOUTHEASTERN MASSACHUSETTS UNIVERSITY	1982	0	1	0	0	1	0	0	0	0	0	1	6	2	1
	1983	1	15	9	3	0	0	0	2	2	1	0	38	28	5
	1984	0	17	2	1	0	0	0	4	2	0	0	43	20	6
	1985	0	16	1	0	0	0	1	2	0	0	0	39	17	3
	1986	1	1	0	0	0	0	0	0	0	0	0	19	2	0
UNIVERSITY OF LOWELL	1983	3	10	6	0	0	0	3	1	2	2	0	21	19	8
	1984	7	19	1	0	0	0	3	9	3	0	0	27	27	15
	1985	6	21	0	0	0	0	4	7	0	0	0	31	27	11
	1986	14	36	0	0	0	0	11	0	0	0	0	53	50	11
UNIVERSITY OF MASSACHUSETTS AT AMHERST	1982	2	0	3	2	0	0	1	1	2	0	0	9	7	4
	1983	8	85	14	4	0	0	3	13	8	7	1	155	111	32
	1984	11	125	13	2	0	0	6	22	13	0	0	199	151	41
	1985	30	153	5	0	0	0	24	43	0	0	0	229	188	67
	1986	56	29	0	0	0	0	26	0	0	0	0	247	85	26
UNIVERSITY OF MASSACHUSETTS AT BOSTON	1983	3	0	0	0	0	0	1	0	0	0	0	3	3	1
	1984	4	0	0	0	0	0	4	0	0	0	0	7	4	4
	1985	2	0	0	0	0	0	1	0	0	0	0	2	2	1
	1986	3	0	0	0	0	0	1	0	0	0	0	4	3	1
WESTFIELD	1983	2	79	7	4	1	0	1	12	14	8	0	538	93	35
	1984	5	63	10	0	0	0	0	6	9	0	0	526	78	15
	1985	7	62	0	0	0	0	2	12	0	0	0	599	69	14
WORCESTER STATE	1983	37	28	8	3	1	0	31	6	2	3	0	102	77	42
	1984	43	35	5	1	0	0	37	4	1	0	0	107	84	42
	1985	54	19	0	0	0	0	31	16	0	0	0	104	73	47
	1986	69	4	0	0	0	0	42	0	0	0	0	165	73	42
PUBLIC AGGREGATE	1982	72	215	40	16	7	0	53	28	16	7	16	444	350	120
	1983	154	569	100	24	3	0	82	89	69	41	1	1499	850	282
	1984	269	482	63	5	0	0	93	102	66	0	0	1456	819	261
	1985	181	617	16	0	0	0	87	152	1	0	0	1541	814	240
	1986	250	264	0	0	0	0	110	0	0	0	0	989	514	110
PRIVATE AGGREGATE	1982	194	370	40	7	12	0	109	27	26	23	19	1208	623	204
	1983	164	255	41	23	3	0	101	30	22	19	0	1023	486	172
	1984	193	247	29	2	0	0	85	32	19	0	0	892	469	136
	1985	336	346	21	0	0	0	95	70	1	0	0	1192	703	166
	1986	146	159	0	0	0	0	48	1	0	0	0	825	305	49

Total Newly Hired in Public Schools and Graduates Mass. Programs Hired

Figure 79.

A.70

Table 19

AGE DISTRIBUTION OF THOSE GRADUATING WHO WERE HIRED BEFORE GRADUATION

YEAR	20-24	25-29	30-34	35--39	40-44	45-49	50-54	55-59	60-64	65+
1982	1	17	33	24	17	11	1	1	0	0
1983	3	21	29	27	18	7	6	1	0	0
1984	5	21	20	37	18	9	1	3	0	0
1985	13	25	28	30	28	10	6	1	0	0
1986	5	13	20	32	24	12	7	0	0	4

Table 20

AGE DISTRIBUTION OF THOSE GRADUATING WHO WERE NOT HIRED BEFORE GRADUATION

YEAR	20-24	25-29	30-34	35--39	40-44	45-49	50-54	55-59	60-64	65+
1982	476	216	147	116	46	19	13	7	2	1
1983	1383	284	143	92	40	33	17	7	8	0
1984	1390	307	120	99	43	34	14	10	4	2
1985	1741	282	172	110	80	27	12	17	3	2
1986	1060	182	127	96	73	23	20	4	2	0

Table 21

AVERAGE AGES OF GRADUATES OF MASSACHUSETTS PROGRAMS
LEADING TO CERTIFICATION

GRADUATION YEAR	ALL GRADUATES	HIRED BEFORE GRADUATION	HIRED AT OR AFTER GRADUATION
1982	29	35	28
1983	26	35	25
1984	26	36	25
1985	26	35	25
1986	27	38	26

Table 18

MASSACHUSETTS PROGRAMS LEADING TO CERTIFCATION: UNADJUSTED DATA

PREHIRED TOTALS: NUMBER OF YEARS HIRED PRIOR TO GRADUATION

YEAR OF GRADUATION

YEARS HIRED PRIOR TO GRADUATION	82	83	84	85	86
1	6	7	7	26	7
2	8	3	4	10	13
3	7	19	8	8	8
	(2.9)	(2.1)	(1.8)	(2.1)	(2.0)
4	12	11	11	7	7
5	15	14	8	17	1
6-10	66 (3.8)	60 (2.3)	38 (1.8)	41 (1.3)	37 (1.9)
11-15	32 (1.9)	41 (1.6)	42 (2.0)	40 (1.2)	40 (2.0)
16-20	10 (0.6)	19 (7.4)	18 (0.8)	29 (0.9)	26 (1.3)
)20	6 (0.4)	9 (0.4)	42 (2.0)	5 (0.1)	18 (0.9)

Table 17

GRADUATES OF MASSACHUSETTS PROGRAMS LEADING TO CERTIFICATION

UNADJUSTED DATA

YEAR	RESPONSE RATE	ALL GRADUATES	HIRED BEFORE GRADUATION	HIRED AT GRADUATION	HIRED ONE YEAR AFTER GRADUATION	HIRED TWO YEAR AFTER GRADUATION	HIRED THREE YEAR AFTER GRADUATION	HIRED FOUR YEAR AFTER GRADUATION	TOTAL HIRED AT OR AFTER GRADUATION	TOTAL GRADS HIRED IN GIVEN YEAR
1982	38.3	1675	162	55	43	30	35	0	163	55
1983	80.9	2544	183	119	92	60	1		272	162
1984	82.9	2366	178	136	87	0			223	258
1985	87.2	2759	183	223	2				225	425
1986	80.9	1839	158	1					1	4

YEAR	ALL GRADUATES	CERTIFIED BEFORE GRADUATION	CERTIFIED AFTER GRADUATION	CERTIFIED ONE YEAR AFTER GRADUATION	CERTIFIED TWO YEAR AFTER GRADUATION	CERTIFIED THREE YEAR AFTER GRADUATION	CERTIFIED FOUR YEAR AFTER GRADUATION
1982	1675	266	598	82	24	19	0
1983	2544	318	836	142	47	6	
1984	2366	462	741	92	7		
1985	2759	517	975	37			
1986	1839	396	430				

Figure 77.

Percent SAT Takers with a Stated Aspiration for Teaching and the Number Hired into the Teaching Workforce in the Previous Year
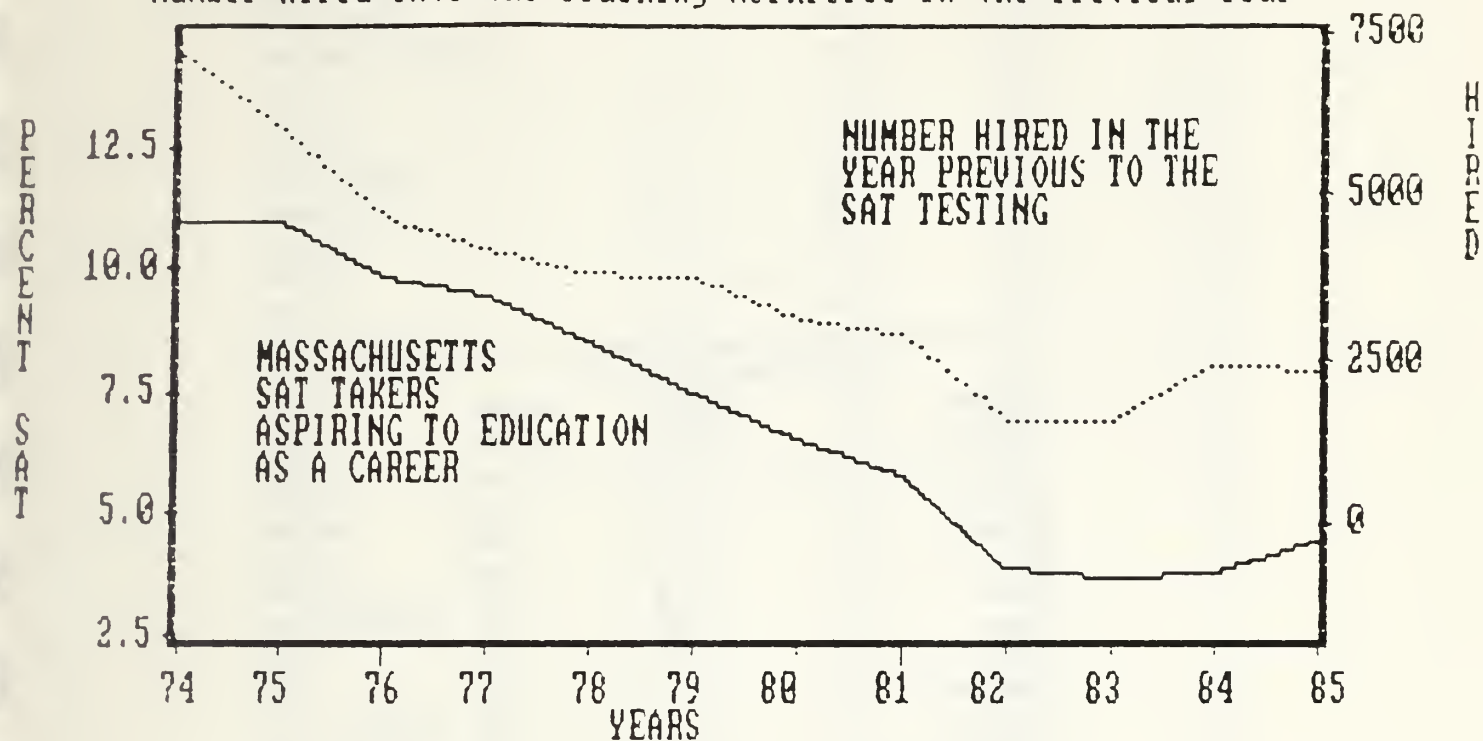
Figure 78.

Individuals Receiving Certificates with Total Hired Previous Year
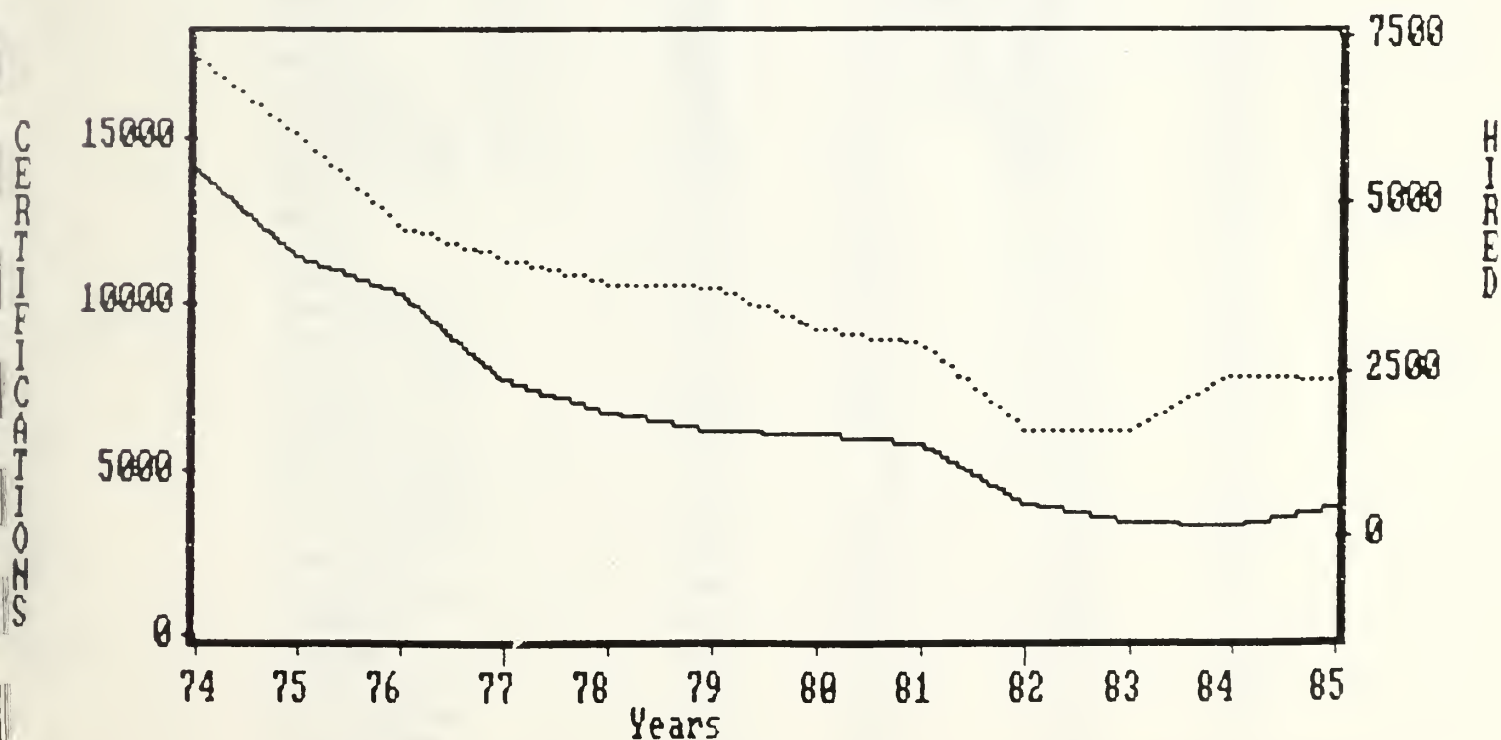
_____ Individuals Receiving Ceritifcates ...Hired in Previous Year

Table 16

AVERAGE ATTRITION RATIOS: AGGREGATE CATEGORIES 1982-1985
1.00 IS AVERAGE ATTRITION

AGGREGATE CATEGORIES	VOLUNTARY ATTRITION	GENERAL ATTRITION
ART STUDIES	2.06	2.63
BILINGUAL	1.98	1.21
SPECIAL ED.	1.51	2.00
FRENCH	1.36	1.39
SPANISH	1.32	1.58
PHYSICS	1.30	1.16
ADMINISTRATORS	1.21	1.98
COUNSELING	1.04	1.01
MATHEMATICS	1.02	0.93
VOCATIONAL STUDIES	0.98	0.84
GENERAL SCIENCE	0.97	0.93
HEALTH STUDIES	0.95	0.99
ENGLISH	0.93	0.98
MEDIA/LIBRARIAN	0.91	0.87
EARLY CHILDHOOD	0.89	0.51
OTHER LANGUAGES	0.88	0.54
SOCIAL STUDIES	0.83	0.51
ELEM. & MIDDLE	0.81	0.69
CHEMISTRY	0.73	0.68
BIOLOGY	0.69	0.63

Table 15

	1973	1977	1981	1985
ELEMENTARY	29.39	31.87	35.34	38.9
YOUNG CHILD. SPEC. NEEDS	28.54	31.6	32.55	35.37
EARLY CHILDHOOD	29.86	34	31.38	30.48
MIDDLE SCHOOL	31	34.82	38.36	38.8
ENGLISH: 2ND LANGUAGE	29.5	31.77	35.06	37.6
ENGLISH	30.58	33.41	37.14	40.61
HISTORY	30.48	33.46	37.24	40.82
GEOGRAPHY	30.04	33.33	36.97	40.87
SOCIAL STUDIES	30.78	33.61	37.21	40.79
MATHEMATICS	29.55	32.15	35.75	39.04
CHEMISTRY	31.55	34.29	37.96	41.38
PHYSICS	32.83	35.34	38.97	42.5
BIOLOGY	29.76	32.45	36.09	39.68
GENERAL SCIENCE	30.15	33.19	36.7	40.02
EARTH SCIENCE	29.79	32.13	35.95	39.92
FRENCH	30.54	32.8	36.5	39.88
GERMAN	30.99	33.48	37.19	40.97
SPANISH	29.47	31.64	35.02	38.85
ITALIAN	31.42	32.51	35.66	40.01
RUSSIAN	31.13	32.8	36.58	40.2
POLISH	0	47	22	37
PORTUGESE	28.44	31.07	34.43	37.92
MODERN LANGUAGES	32.36	36	39.5	42
LATIN	33.74	35.85	39.36	43.34
GREEK	31.47	32.78	35.82	40.79
LATIN & CLASSICS	32	35.57	42	37.25
MATH & SCIENCE	28.92	34.14	36.79	40.13
BEHAVIORAL SCI.	35.33	34.69	38.15	39.41
SECRATERIAL SKILLS	47	37	39.5	35.89
BUSINESS MGMT	29.14	30.21	34.81	35.79
DANCE	0	0	32	30
DRAMA	29.5	30.75	37.83	37.33
PHYSICAL ED.	31.17	34.14	34.5	29.6
HEALTH	31.63	33.52	37.03	40.06
BUSINESS	32.21	34.74	38.51	41.47
HOME ECONOMICS	31.37	32.92	36.78	39.79
INDUSTRIAL ARTS	35.23	36.05	38.98	41.41
CONSULT. READING	30.63	32.86	36.31	39.84
SPECIAL SUBJ:ART	29.54	31.74	35.53	38.96
MUSIC	30.32	31.48	34.67	36.95
SPEECH	30.05	33.08	36.41	39.69
DRIVERS ED.	31.1	33.64	37.35	40.97
GENERIC CONSULT.	29.97	32.45	34.06	38.18
SEVERE SPEC. NEEDS	32	28.43	30.46	32.03
MOD. SPEC. NEEDS	28.73	31.37	34.15	32.95
AUDIO/VIS. SPEC.	31.67	34.44	38.51	42.16
HEAR/LANG DIS.	27.67	29.16	31.43	35.3
SPEC. NEED:VISION	32	37	29.5	31.55
SPEC. NEED:AUDITION	42	44.5	36.44	37.17
UNIF. MEDIA SPEC.	33.84	36.9	41	43.62
SCHOOL PSYCH.	34.45	36.49	39.73	42.53
GUIDANCE COUNSLR	31.88	34.72	38.48	41.86
GUIDANCE DIR.	33.36	36.28	39.99	43.42
PRINCIPAL	30.71	33.1	36.98	40.4
SCHOOL BUS ADMIN	31.35	34.2	37.96	41.61
ELEM. PRINCIPAL	30.53	33.47	37.01	40.76
SEC. PRINCIPAL	31.31	34.43	38.03	41.74
LIBRARIAN	35.66	38.26	41.23	44.23
SUPERINTENDENT	32.83	36.14	39.49	42.99

Table 14

RETENTION TRENDS AND SHOCKS
==

AGE COHORT	GENERAL RETENTION COEFFICIENT	SHOCK EFFECT OF PROP 2 1/2	TREND OVER TIME
20-24	.9079	-.2521	-..0096
25-29	.8936	-.1243	-..0029
30-34	.9377	-.0518	-..0023
35-39	.9657	-.0450	-..0017
40-44	.9748	-.0404	-..0014
45-49	.9741	-.0242	-..0007
50-54	.9713	-.0239	-..0007
55-59	.9460	-.0388	-..0019
60-64	.8188	-.0644	-..0031
65+	.6778	-.0763	-..0002

Table 13

TOTAL TOTAL WORKFORCE: RETENTION BY AGE 1973-74 TO 1984-85

AGE	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85
22	89.4	90.2	90.0	86.8	83.0	84.6	84.1	56.9	77.9	85.0	80.7	76.7
23	87.2	89.5	87.9	88.4	85.6	84.1	82.8	55.4	76.2	81.2	84.8	78.7
24	87.5	90.3	88.4	90.1	87.2	85.4	84.2	59.8	79.1	82.8	78.3	82.7
25	85.9	88.8	89.1	89.4	85.9	86.7	85.9	66.6	80.1	87.1	85.4	82.8
26	86.5	88.9	88.6	88.7	86.6	87.9	87.3	68.2	81.2	89.1	85.8	82.1
27	85.9	89.2	88.6	89.3	87.0	86.1	86.6	74.5	84.1	86.3	86.6	85.0
28	88.9	89.9	89.6	90.7	88.4	88.5	87.9	76.8	85.4	88.9	87.6	85.1
29	89.5	92.0	90.9	91.4	89.2	89.1	88.3	79.7	84.0	88.3	88.4	89.1
30	90.2	92.2	92.4	91.8	89.4	90.2	90.0	82.1	88.0	89.0	89.1	87.3
31	92.6	93.5	92.5	93.7	91.5	92.1	91.3	84.8	88.4	90.4	89.7	88.6
32	94.2	94.2	93.6	94.2	92.0	92.5	92.2	87.6	90.5	91.5	92.5	90.3
33	94.7	95.6	94.5	95.1	93.3	92.3	93.2	88.8	91.6	93.3	93.0	92.4
34	94.9	95.0	95.0	95.7	93.2	93.8	93.6	89.4	93.4	93.5	93.1	93.9
35	95.3	96.4	96.3	95.6	94.6	95.1	94.2	90.3	92.7	93.9	94.4	94.4
36	96.4	96.2	96.5	96.2	95.2	94.7	94.3	89.9	93.7	95.0	94.2	94.7
37	94.5	96.6	97.0	96.7	95.5	94.8	96.0	90.8	94.9	95.5	95.0	94.9
38	96.8	95.9	96.5	96.3	96.5	95.9	95.2	90.3	94.9	95.7	95.4	94.8
39	96.9	96.8	97.0	97.6	96.1	96.1	95.7	92.4	94.9	95.5	95.7	95.6
40	97.0	97.1	97.5	97.4	96.1	95.2	95.1	92.0	96.3	96.3	96.7	95.3
41	97.5	97.1	97.1	97.2	96.8	96.3	96.7	91.7	95.1	96.1	96.9	95.1
42	97.3	97.3	97.2	96.8	96.8	96.2	96.5	92.1	95.4	96.3	96.3	95.7
43	96.8	97.3	98.2	98.3	97.6	96.2	96.2	92.8	95.5	96.2	96.7	96.1
44	97.1	97.3	97.0	97.4	96.5	97.0	96.4	93.0	96.1	96.2	96.2	96.4
45	96.3	98.4	97.8	97.1	96.6	96.9	96.0	93.5	95.8	97.7	96.8	96.1
46	97.6	97.2	97.5	97.7	96.9	96.8	96.6	93.7	95.8	97.0	97.1	95.9
47	96.6	97.5	98.1	97.0	97.2	96.6	96.7	95.0	96.0	96.8	97.2	97.3
48	96.7	97.5	97.9	97.8	96.9	97.5	97.4	94.8	96.7	96.7	95.7	95.9
49	96.9	97.1	97.0	97.5	97.1	97.2	96.0	95.1	97.7	96.9	97.1	97.6
50	97.5	97.8	97.0	97.1	96.6	96.5	96.7	94.6	97.0	96.6	97.4	97.1
51	97.0	97.3	97.2	97.8	96.4	96.7	97.3	94.1	95.7	97.5	97.7	97.1
52	97.3	97.2	97.2	97.7	97.0	97.4	96.5	95.0	95.8	96.6	97.2	96.3
53	97.0	97.2	98.1	97.7	97.2	96.2	96.9	94.7	96.4	96.8	96.2	97.6
54	96.8	95.9	95.2	96.9	96.0	94.3	92.8	92.0	93.8	94.6	95.6	94.4
55	95.1	95.2	96.1	95.9	96.1	94.5	94.6	91.8	95.1	94.2	95.3	93.2
56	96.2	96.0	95.7	95.4	96.1	95.0	94.9	91.8	92.7	93.4	93.1	94.0
57	94.8	95.9	94.7	96.0	94.0	93.7	93.9	90.6	92.8	92.6	92.1	91.2
58	93.1	93.2	94.1	94.9	93.1	93.1	92.6	88.8	92.9	92.4	92.7	92.9
59	88.1	90.0	91.3	89.9	88.4	88.4	89.8	82.0	86.7	88.5	90.3	88.9
60	85.2	89.4	89.0	89.7	89.9	84.6	87.8	78.1	86.4	87.0	87.0	85.4
61	83.7	85.5	83.4	82.3	80.3	83.8	80.8	74.7	75.3	79.9	81.8	79.5
62	79.2	79.0	81.6	81.8	84.1	76.7	75.3	73.8	77.3	77.8	76.9	79.8
63	80.1	77.7	81.6	81.2	80.1	78.8	74.8	76.0	78.8	77.2	80.5	75.2
64	66.5	69.2	71.7	71.2	72.3	67.7	71.3	55.7	63.1	71.0	67.2	64.3
65	72.6	62.9	66.3	72.7	63.5	53.5	61.2	56.8	66.2	62.8	65.8	59.6
66	75.6	69.6	72.9	66.8	68.8	69.5	57.1	69.3	65.1	71.6	76.3	69.9
67	67.7	67.1	64.7	74.0	72.7	70.0	71.4	61.8	75.0	75.3	72.1	83.0
68	68.9	64.7	66.7	70.0	68.7	61.5	64.8	52.0	68.1	75.8	67.2	69.4
69	8.5	14.4	16.9	8.9	15.2	23.5	25.4	28.8	25.6	32.4	32.0	27.9

Table 11

AVERAGE AGES: ACTIVE WORKFORCE AND AT ATTRITION

	ACTIVE	NEWLY HIRED	FORMALLY LEFT TEACHING ()= AVE. YEARS IN SYSTEM		INACTIVE ()= AVE. YEARS IN SYSTEM		RETIRED ()= AVE. YEARS IN SYSTEM	
1973	36	27	30	(4)	30	(5)	61	(31)
1974	36	26	31	(5)	31	(5)	61	(30)
1975	36	27	31	(6)	31	(5)	61	(30)
1976	37	27	31	(6)	31	(5)	61	(29)
1977	37	28	32	(5)	31	(6)	60	(28)
1978	38	28	33	(7)	33	(6)	60	(27)
1979	38	29	34	(8)	33	(7)	60	(27)
1980	39	29	32	(8)	33	(7)	59	(27)
1981	40	30	35	(7)	34	(7)	59	(27)
1982	41	31	36	(9)	36	(8)	59	(26)
1983	41	32	35	(9)	36	(9)	59	(27)
1984	41	31	36	(8)	37	(9)	59	(26)

Table 10

AGE DISTRIBUTION OF WORKFORCE
==
1973-1985

YEAR	20-24	25-29	30-34	35--39	40-44	45-49	50-54	55-59	60-64	65+
1973	0.1298	0.2659	0.1417	0.1013	0.1005	0.0868	0.0681	0.0545	0.0384	0.0130
1974	0.1100	0.2709	0.1550	0.1030	0.1018	0.0885	0.0696	0.0537	0.0353	0.0123
1975	0.0889	0.2711	0.1697	0.1069	0.1012	0.0929	0.0706	0.0540	0.0334	0.0113
1976	0.0662	0.2569	0.1902	0.1166	0.1012	0.0968	0.0726	0.0570	0.0323	0.0104
1977	0.0485	0.2311	0.2134	0.1289	0.1024	0.0989	0.0770	0.0577	0.0320	0.0100
1978	0.0394	0.1996	0.2260	0.1448	0.1071	0.1004	0.0818	0.0585	0.0320	0.0100
1979	0.0313	0.1713	0.2371	0.1593	0.1104	0.1031	0.0855	0.0611	0.0329	0.0094
1980	0.0261	0.1431	0.2409	0.1741	0.1163	0.1039	0.0915	0.0631	0.0326	0.0083
1981	0.0134	0.1029	0.2322	0.1981	0.1298	0.1109	0.1015	0.0688	0.0330	0.0080
1982	0.0109	0.0796	0.2079	0.2210	0.1443	0.1138	0.1060	0.0737	0.0355	0.0069
1983	0.0108	0.0647	0.1822	0.2345	0.1610	0.1179	0.1071	0.0776	0.0356	0.0073
1984	0.0113	0.0560	0.1578	0.2447	0.1759	0.1203	0.1084	0.0798	0.0361	0.0080
1985	0.0124	0.0489	0.1327	0.2498	0.1907	0.1254	0.1093	0.0844	0.0381	0.0076

Table 12

RETENTION BY AGE: 5 YEAR COHORTS
==
1973-1984

YEAR	20-24	25-29	30-34	35--39	40-44	45-49	50-54	55-59	60-64	65+
1973	0.8781	0.8701	0.9292	0.9596	0.9717	0.9683	0.9714	0.9366	0.7996	0.7183
1974	0.8999	0.8957	0.9393	0.9636	0.9722	0.9754	0.9710	0.9421	0.8118	0.6608
1975	0.8851	0.8934	0.9348	0.9665	0.9742	0.9767	0.9692	0.9457	0.8254	0.6752
1976	0.8901	0.8999	0.9389	0.9644	0.9739	0.9740	0.9743	0.9462	0.8227	0.7086
1977	0.8606	0.8756	0.9161	0.9550	0.9675	0.9695	0.9663	0.9371	0.8251	0.6764
1978	0.8485	0.8779	0.9202	0.9523	0.9616	0.9698	0.9629	0.9315	0.7989	0.6210
1979	0.8371	0.8738	0.9197	0.9504	0.9617	0.9653	0.9613	0.9328	0.7938	0.6281
1980	0.5788	0.7463	0.8672	0.9067	0.9231	0.9443	0.9414	0.8919	0.7369	0.6000
1981	0.7802	0.8355	0.9065	0.9410	0.9570	0.9638	0.9578	0.9237	0.7806	0.6799
1982	0.8262	0.8804	0.9180	0.9501	0.9621	0.9703	0.9645	0.9249	0.8002	0.6925
1983	0.8071	0.8713	0.9180	0.9487	0.9658	0.9681	0.9685	0.9291	0.8050	0.6964
1984	0.8005	0.8546	0.9105	0.9484	0.9567	0.9653	0.9651	0.9226	0.7902	0.6858

Figure 75.

Size of Age Cohorts 20-24 to 40-44 for Years 1973-1985
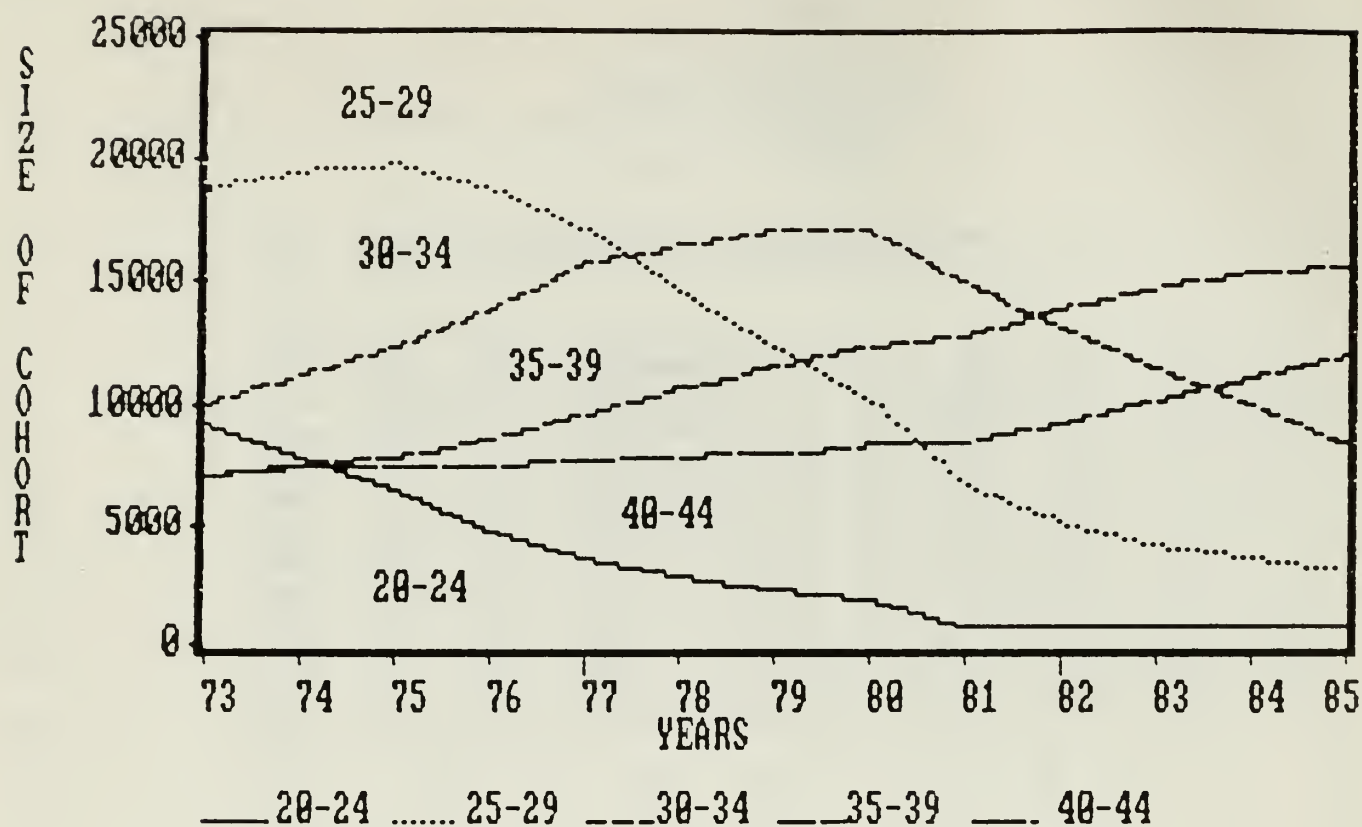
Figure 76.

Size of Age Cohorts 45-49 to 65+ for Years 1973 to 1985
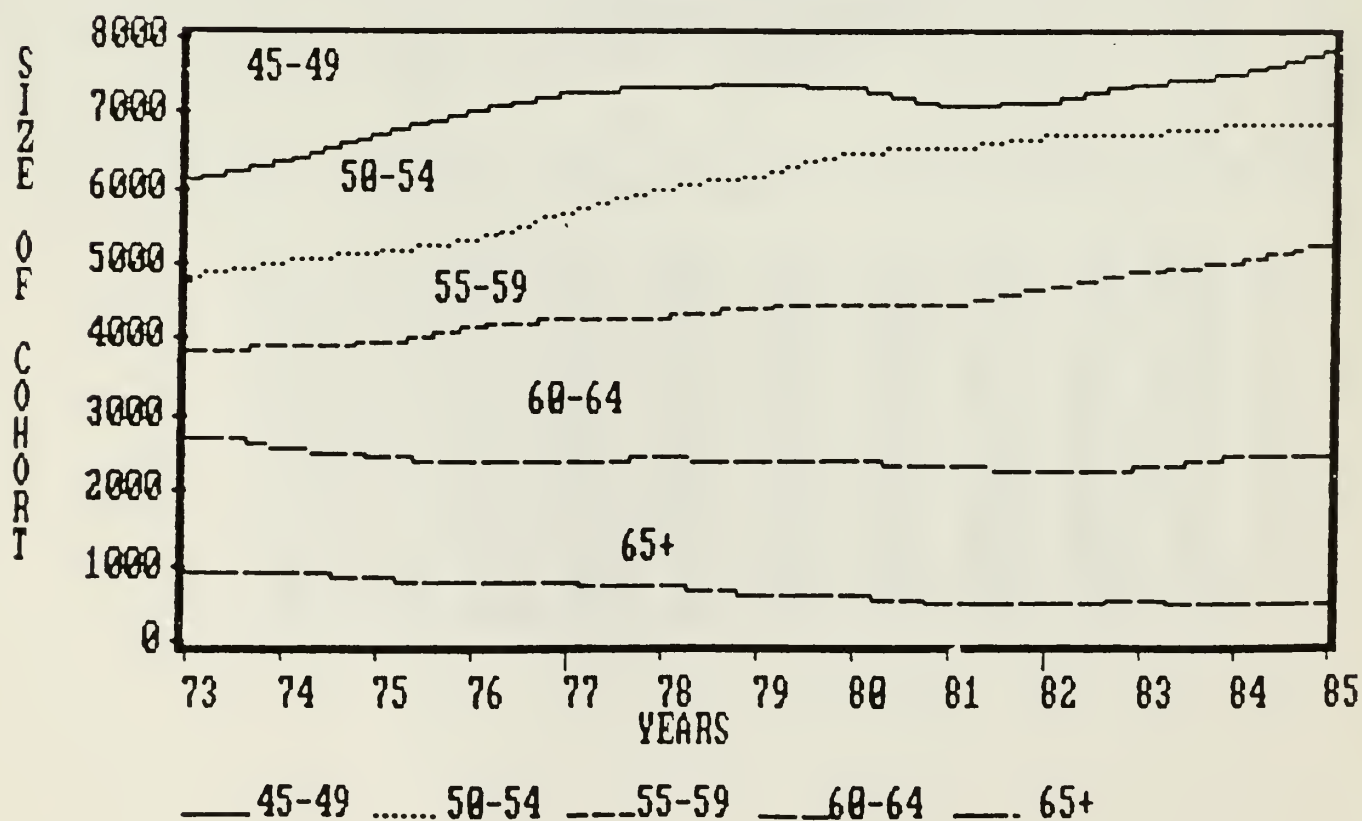
ENROLLMENTS 1982 TO 1995 FOR:
HEALTH STUDIES

Figure 71.

YEARS
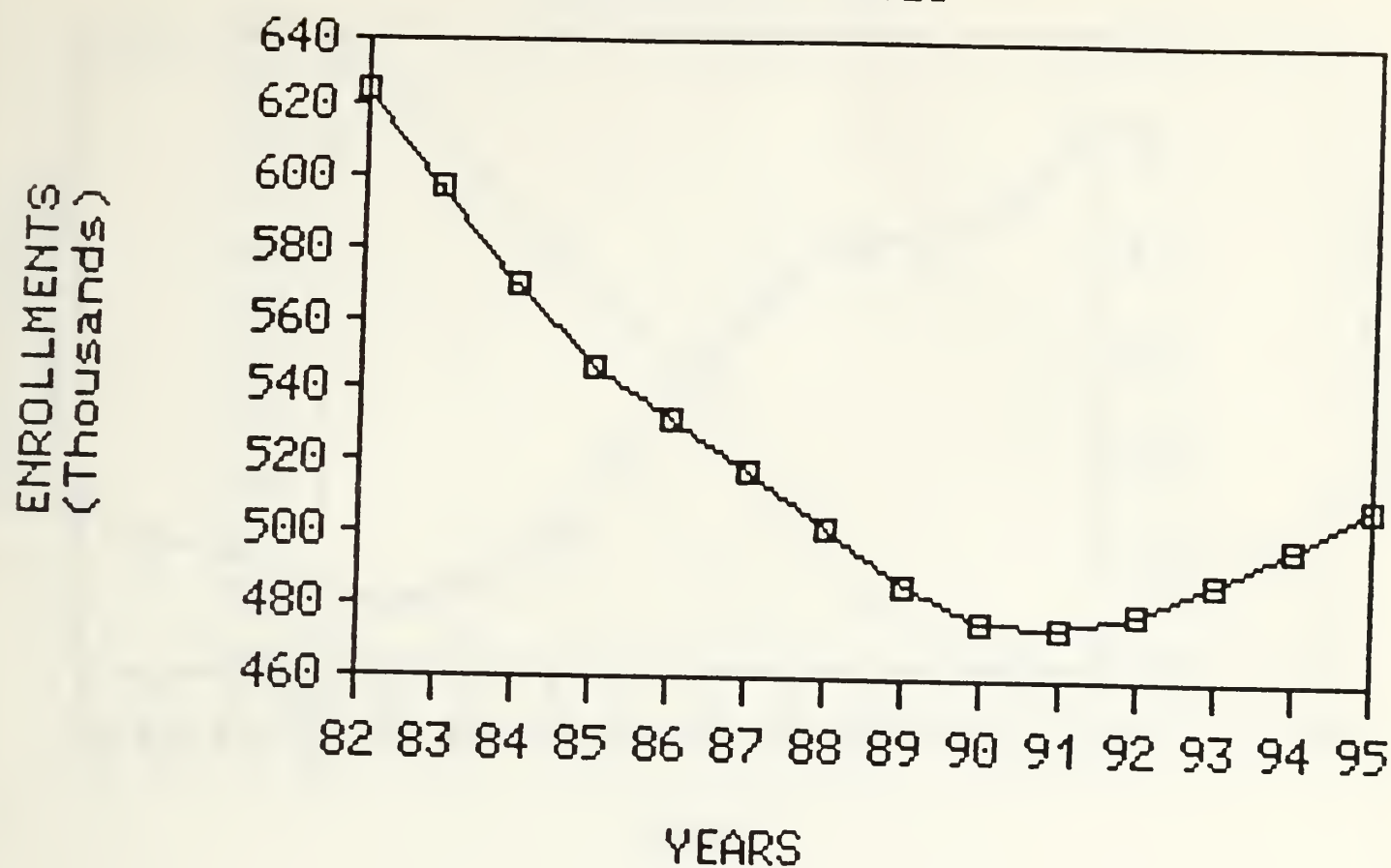
ENROLLMENTS 1982 TO 1995 FOR:
ART STUDIES

Figure 72.
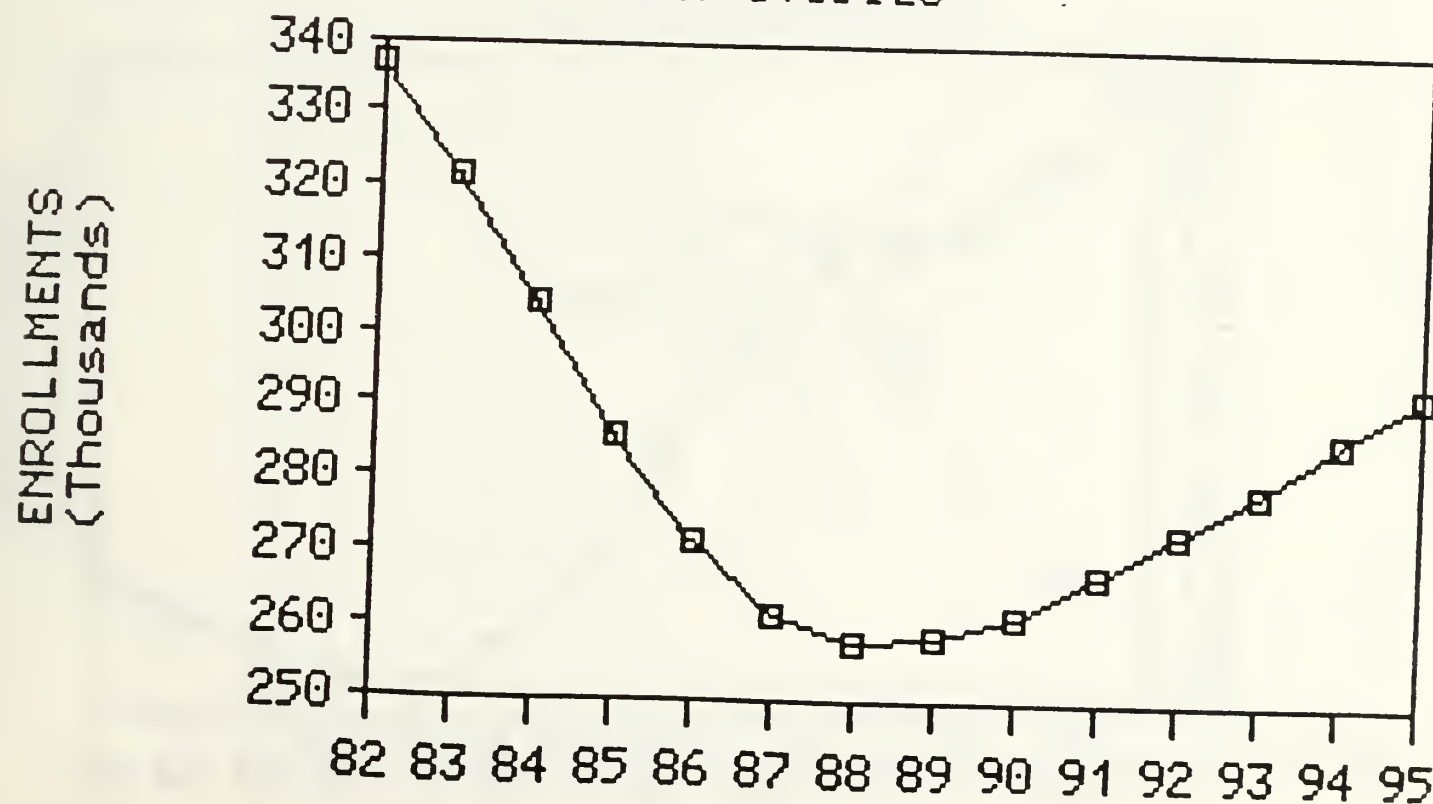
ENROLLMENTS 1982 TO 1995 FOR: Figure 69.
OTHER LANGUAGES
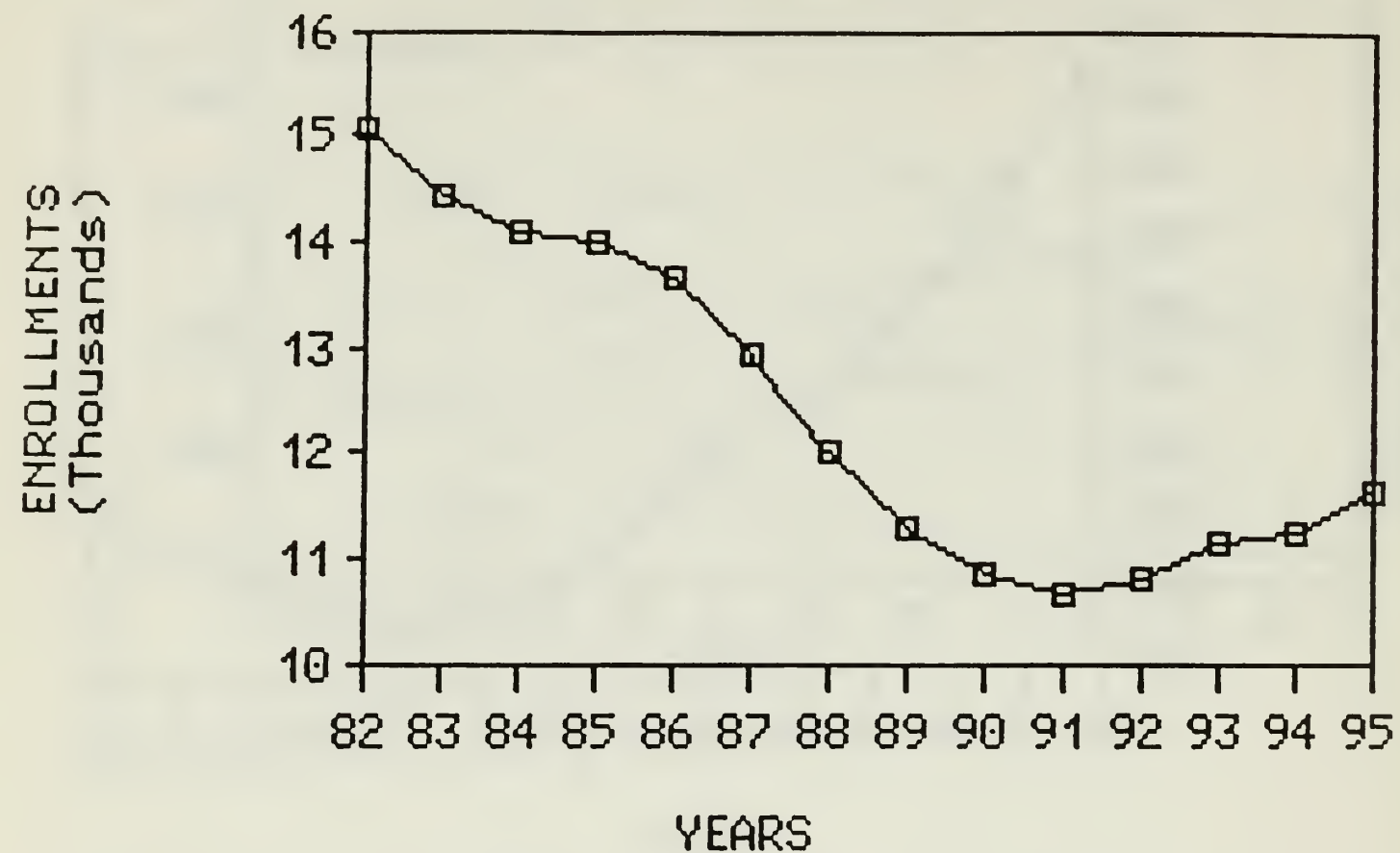
YEARS

ENROLLMENTS 1982 TO 1995 FOR: Figure 70.
FRENCH OR SPANISH

ENROLLMENTS 1982 TO 1995 FOR: Figure 67.
SOCIAL STUDIES

ENROLLMENTS (Thousands)

YEARS

ENROLLMENTS 1982 TO 1995 FOR: Figure 68.
CHEMISTRY

ENROLLMENTS (Thousands)
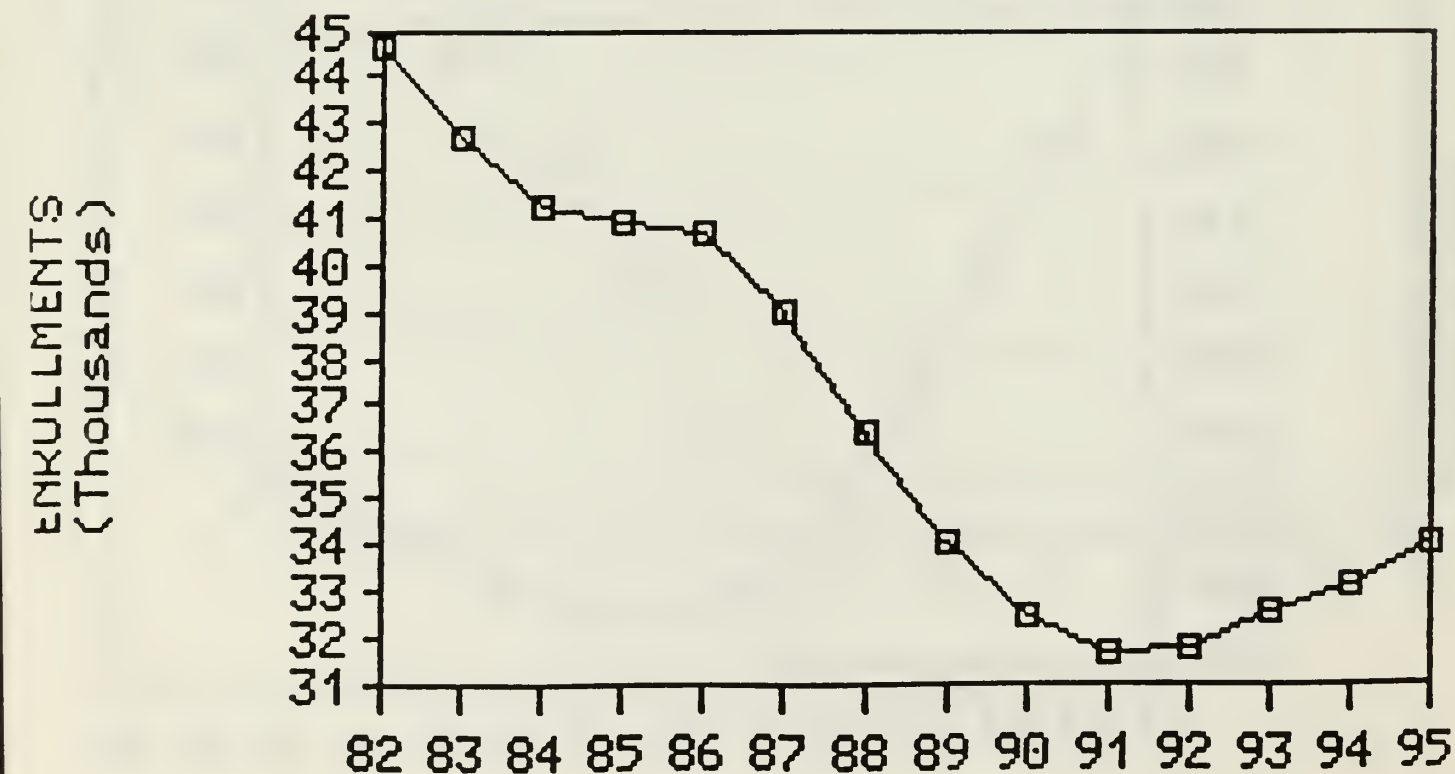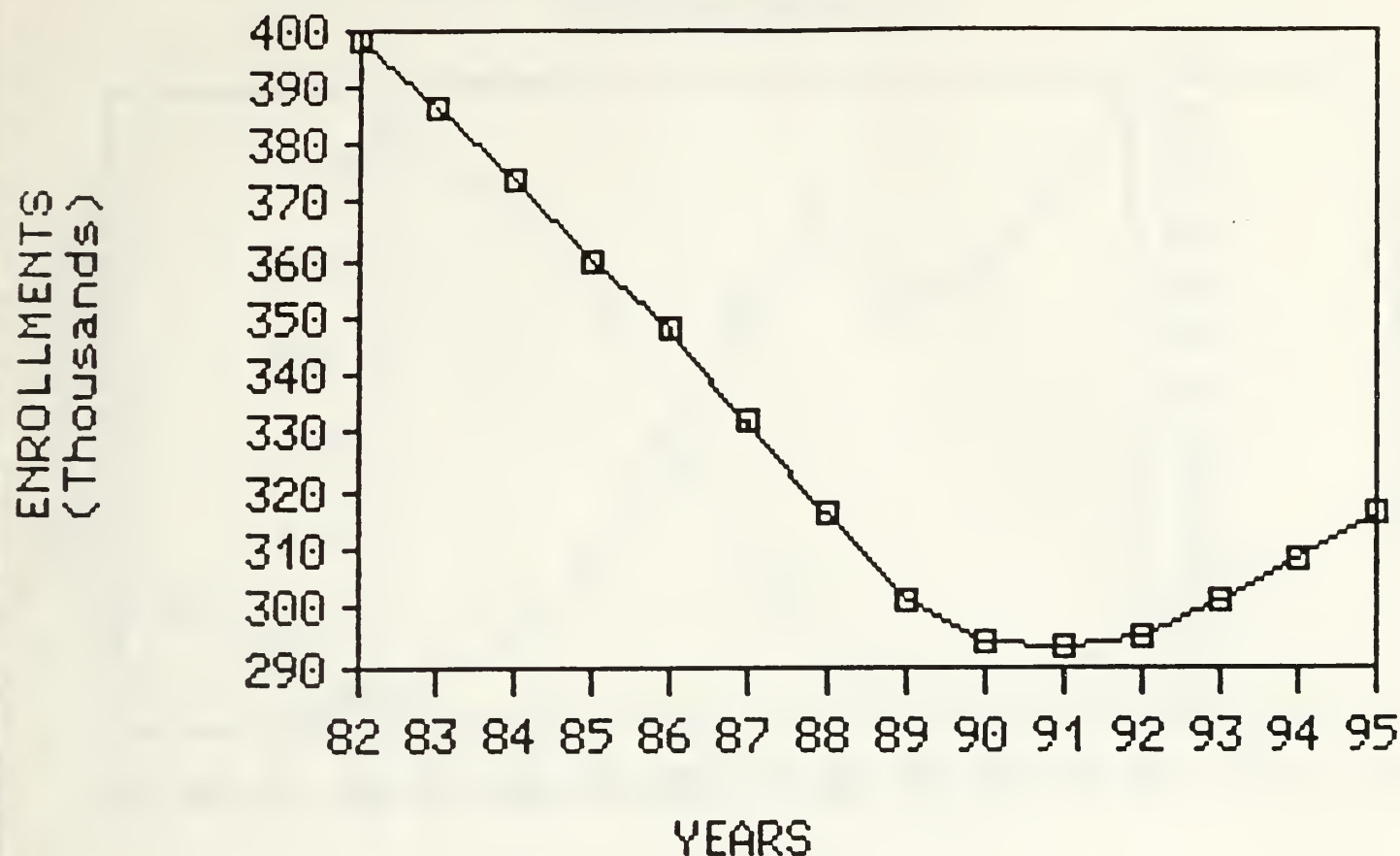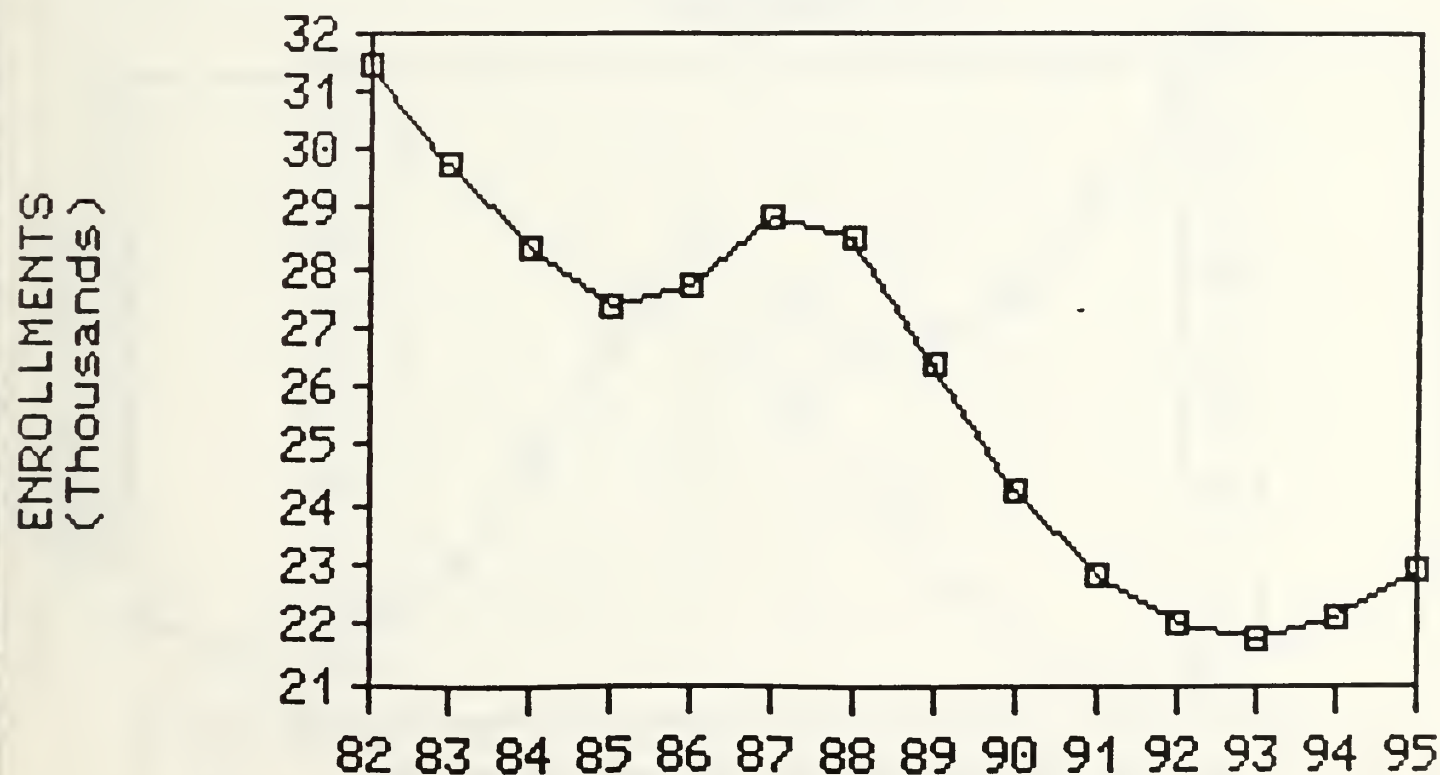
ENROLLMENTS 1982 TO 1995 FOR: Figure 65.
BIOLOGY

YEARS
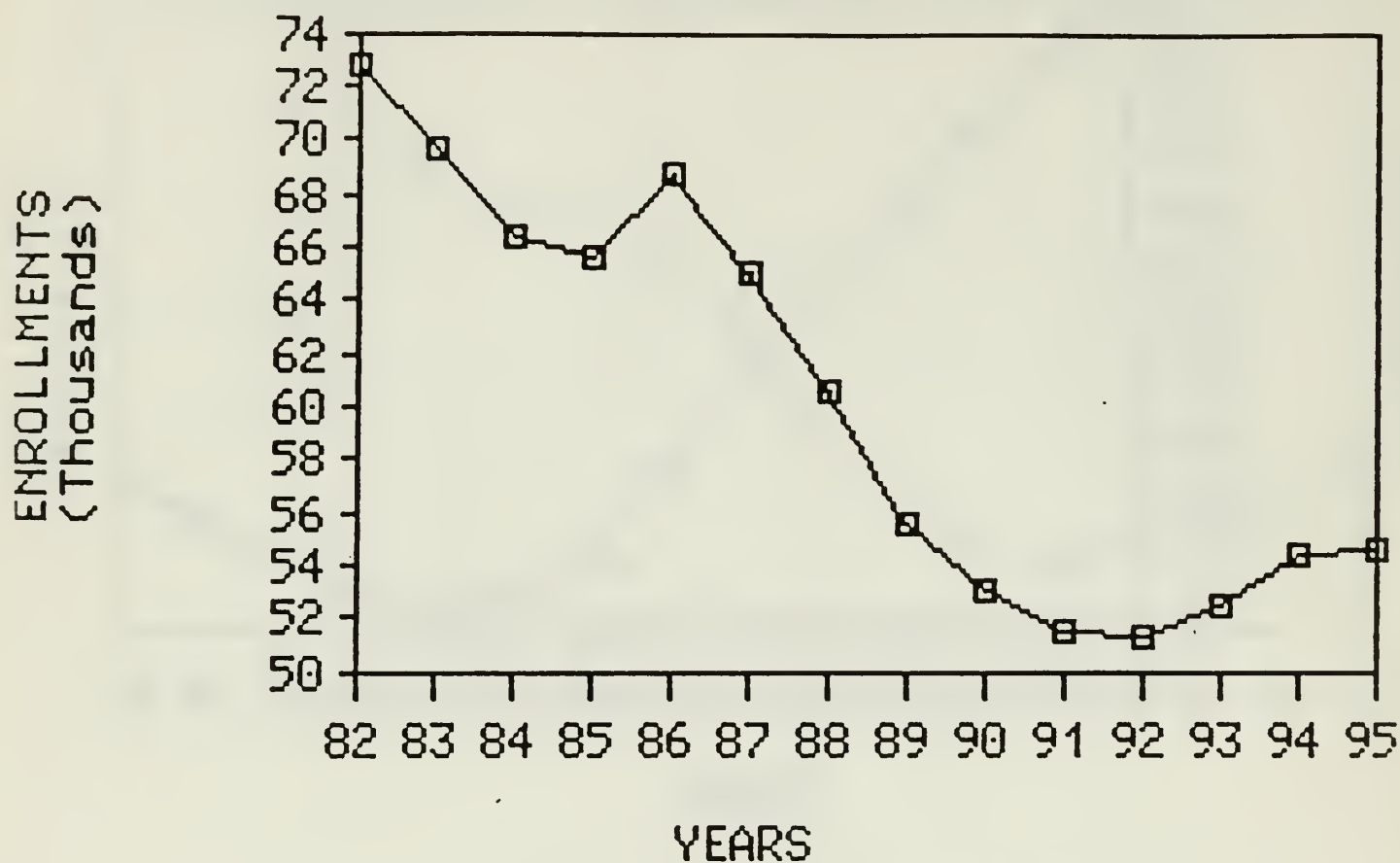
ENROLLMENTS 1982 TO 1995 FOR: Figure 66.
PHYSICS
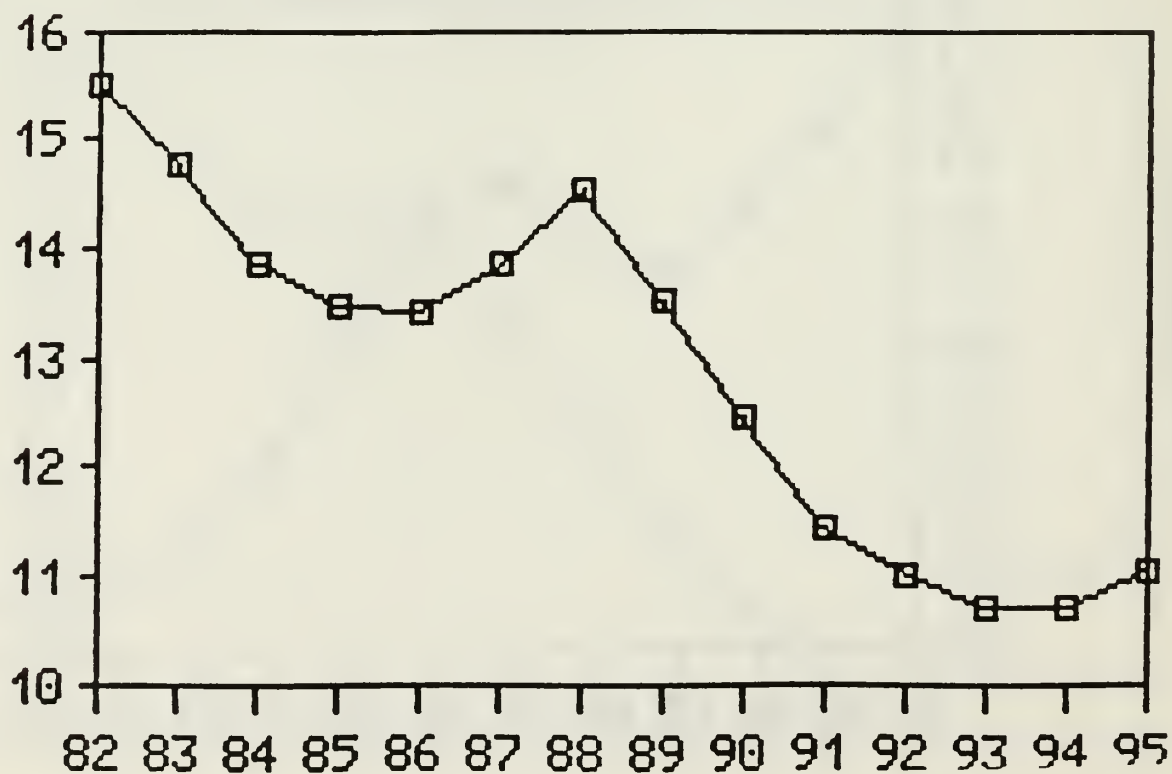
A.53

ENROLLMENTS 1982 TO 1995 FOR: Figure 63.
GENERAL SCIENCE

YEARS
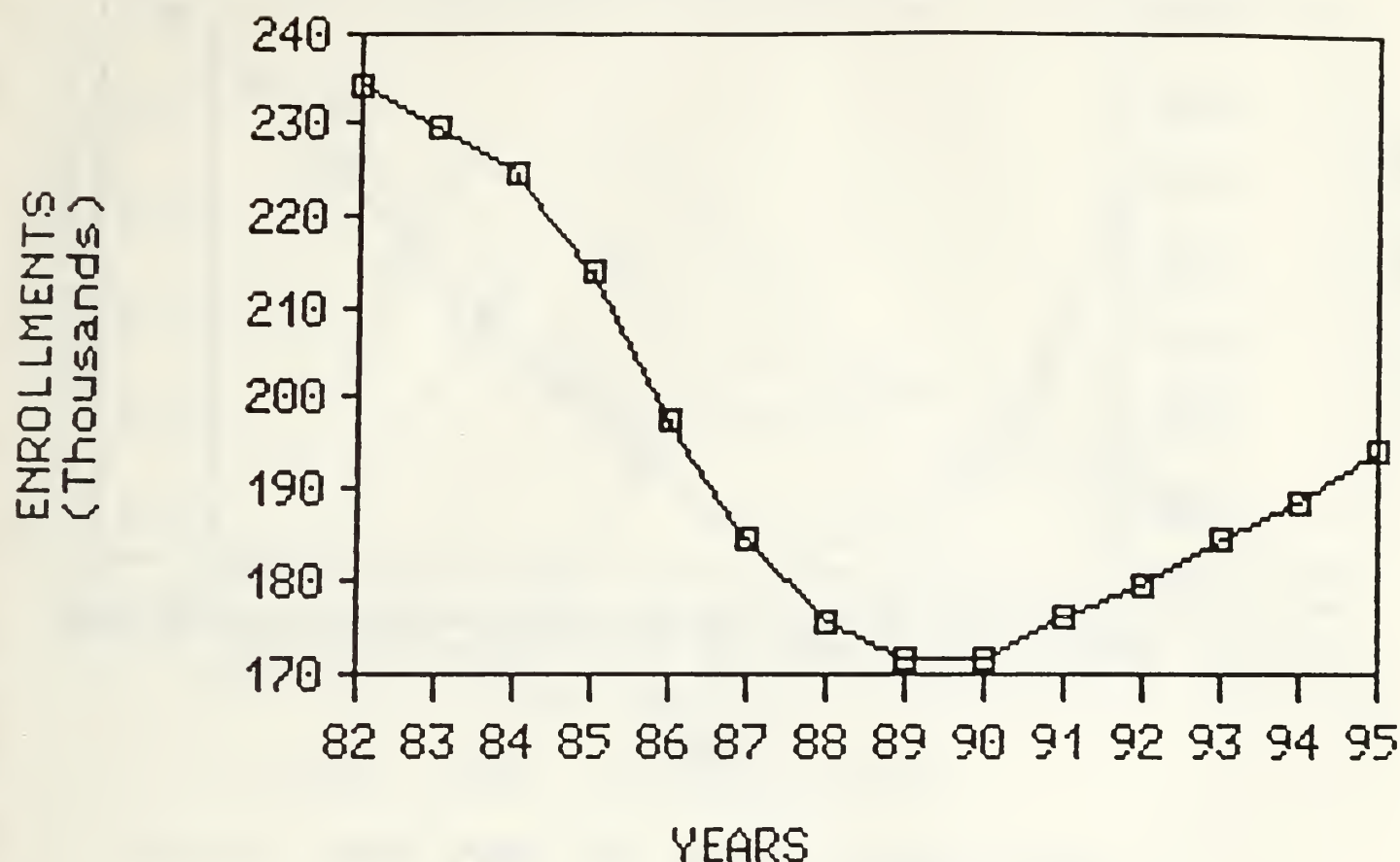
ENROLLMENTS 1982 TO 1995 FOR: Figure 64.
MATHEMATICS
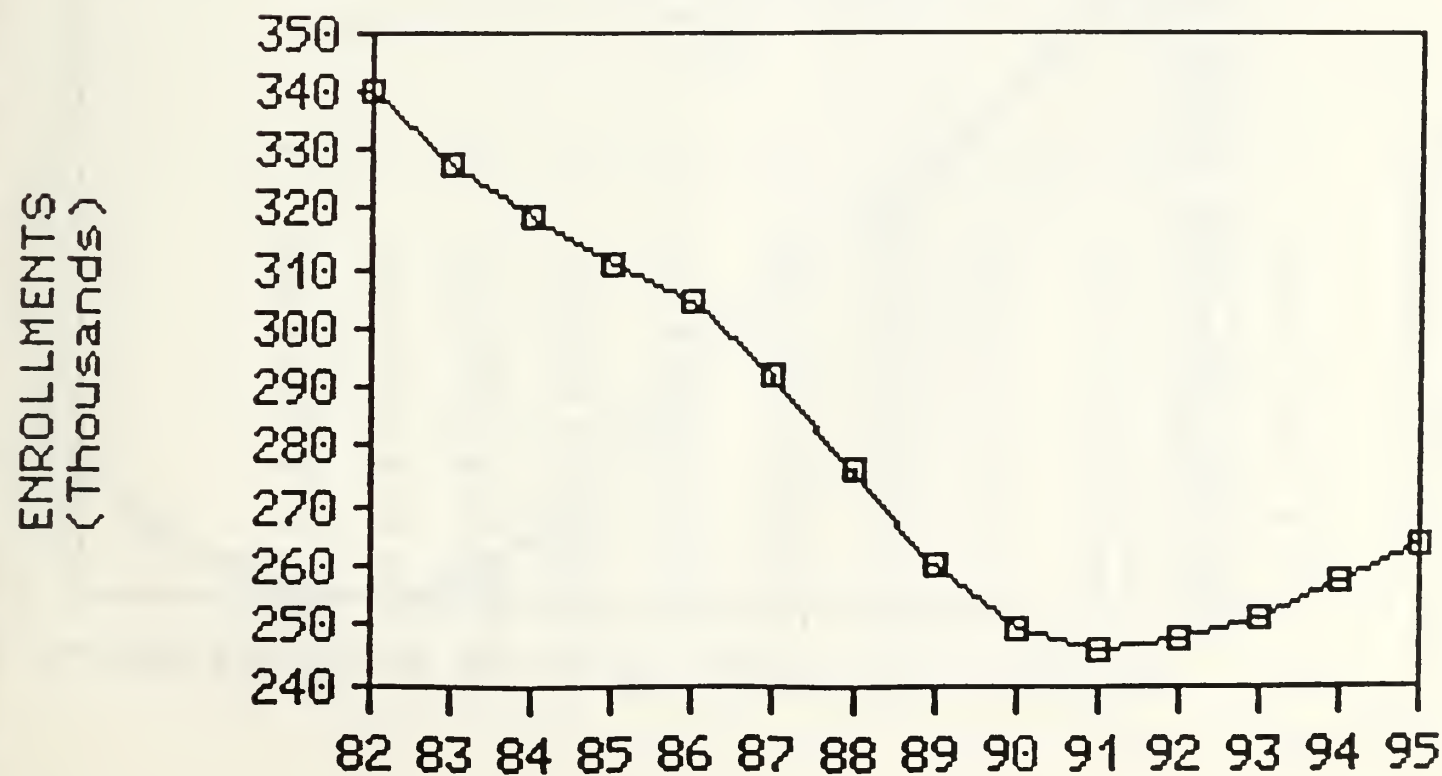
ENROLLMENTS 1982 TO 1995 FOR:
ELEMENTARY & MIDDLE
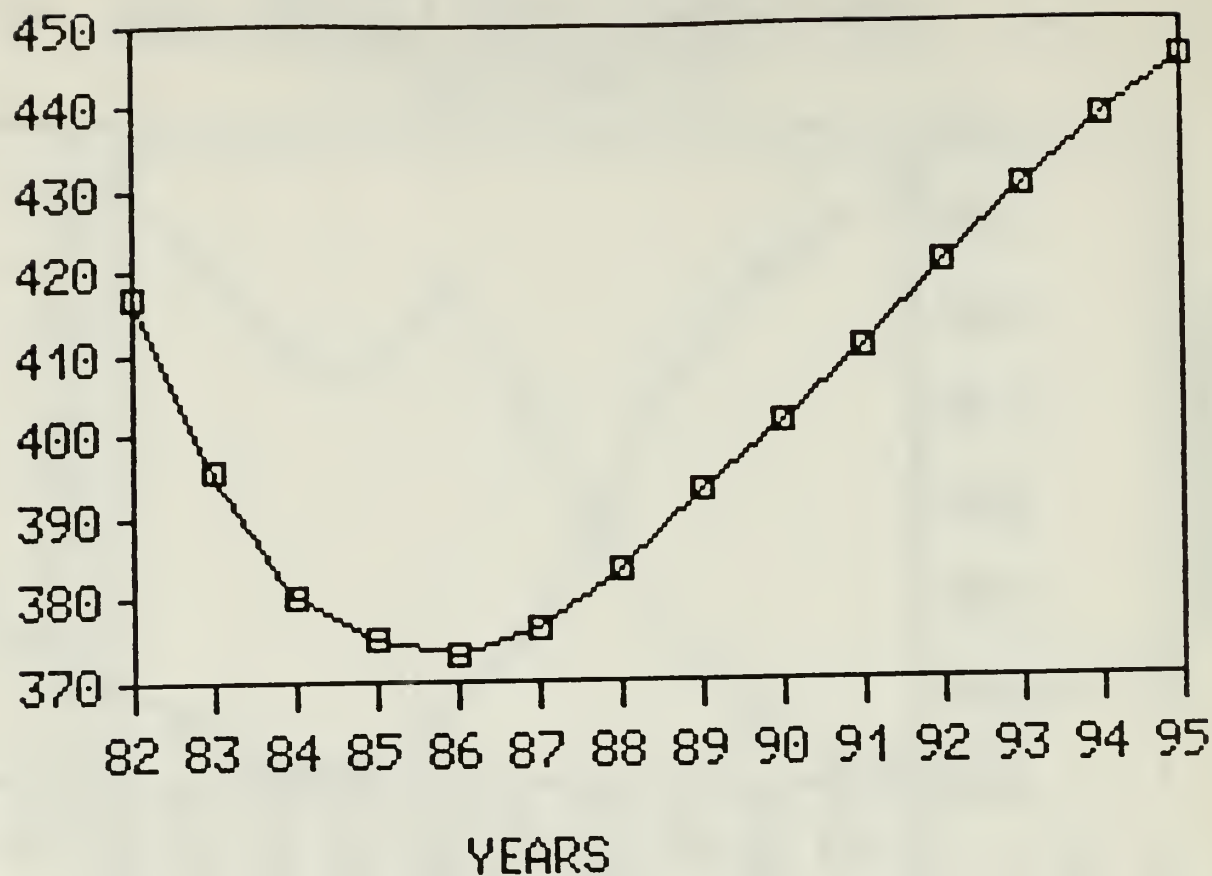
YEARS

ENROLLMENTS 1982 TO 1995 FOR:
ENGLISH

Figure 62.

Figure 74.
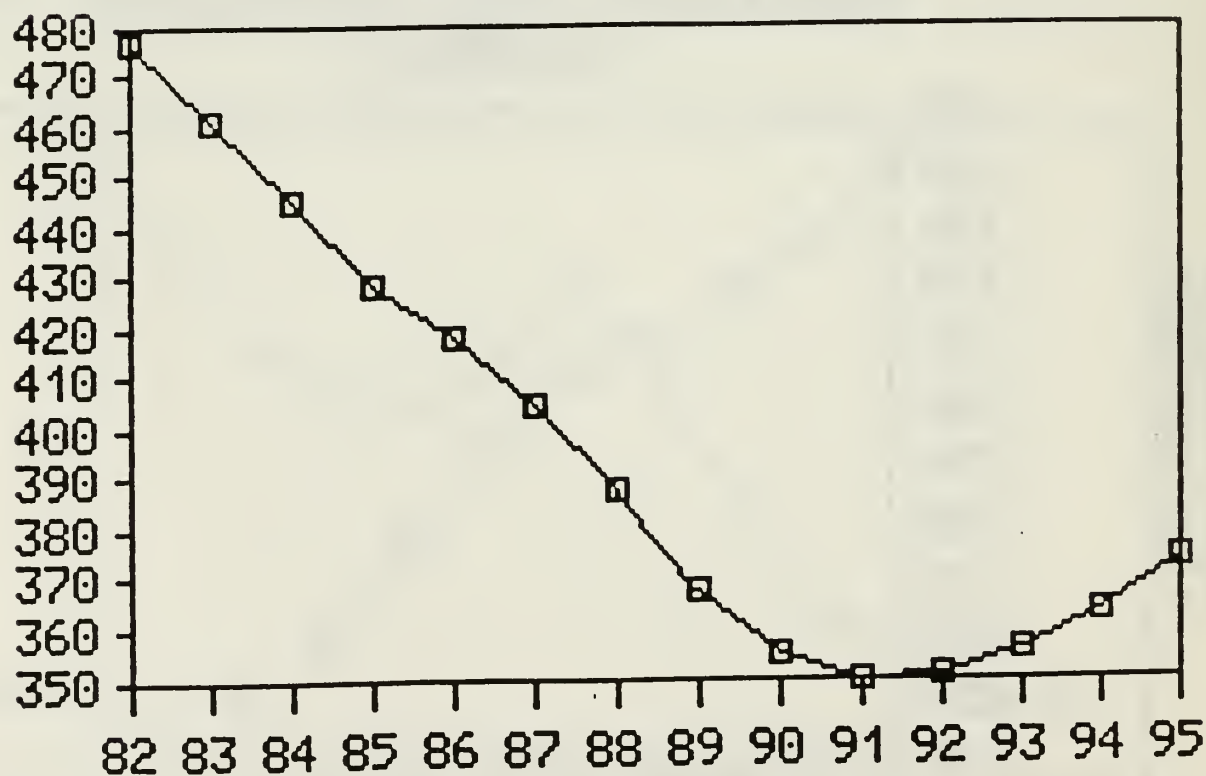
Changing Age Distribution of Workforce by Relative Percentages
Years 1973, 1977, 1981, 1985

___ 1973 1977   ___1981   __ __1985
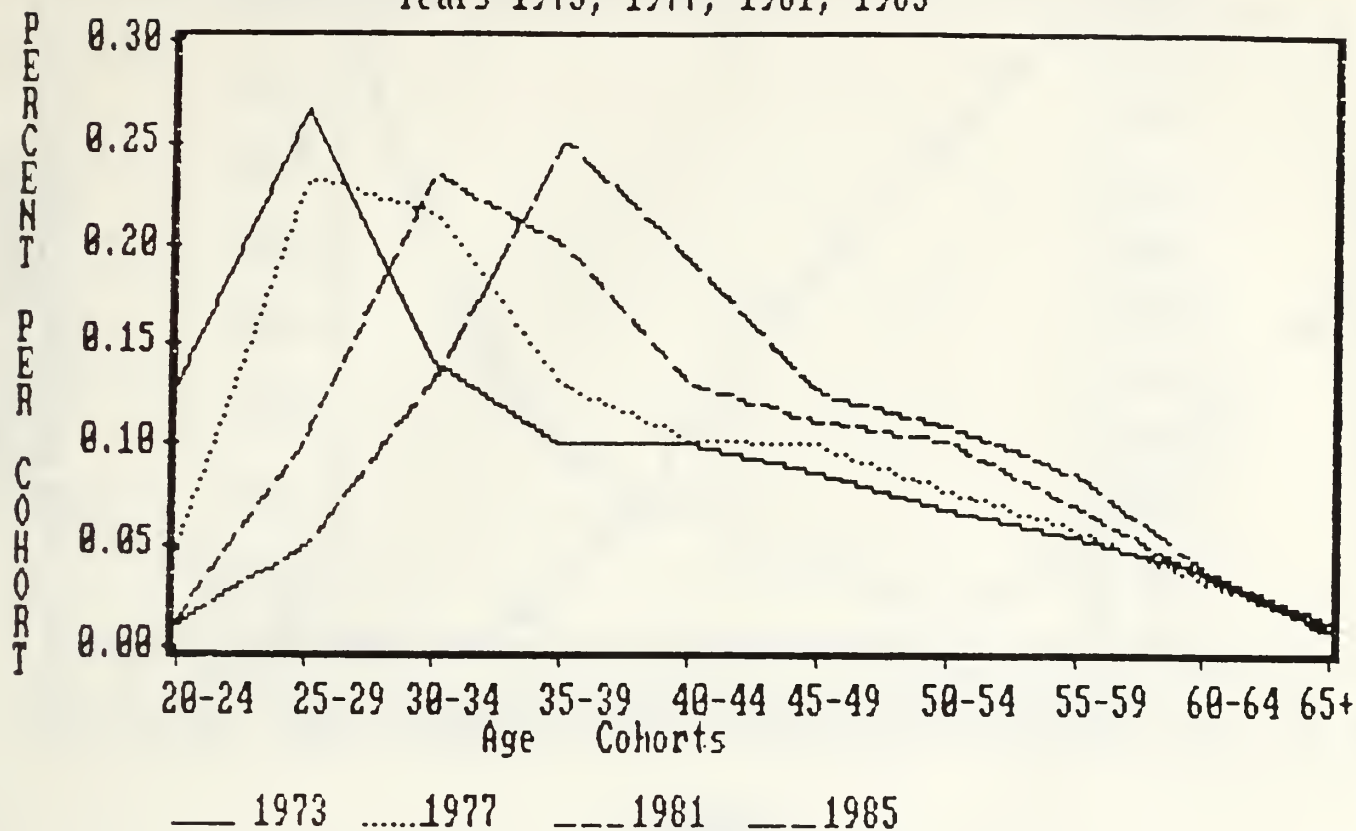
Table 9

TOTAL WORKFORCE BY AGE

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1973-1985

YEAR	20-24	25-29	30-34	35--39	40-44	45-49	50-54	55-59	60-64	65+
1973	9131	18703	9967	7123	7066	6103	4792	3835	2704	916
1974	7891	19438	11121	7393	7302	6351	4998	3853	2534	883
1975	6457	19695	12326	7766	7353	6746	5132	3924	2423	819
1976	4817	18692	13838	8484	7362	7043	5284	4146	2347	755
1977	3571	17001	15698	9482	7536	7273	5663	4245	2356	734
1978	2869	14538	16457	10543	7799	7314	5956	4263	2397	688
1979	2249	12313	17047	11452	7937	7410	6147	4393	2347	594
1980	1846	10109	17022	12299	8218	7337	6466	4457	2330	564
1981	856	6590	14863	12678	8312	7101	6495	4402	2274	442
1982	684	5008	13078	13902	9080	7157	6667	4634	2242	460
1983	674	4047	11398	14668	10073	7377	6699	4852	2261	498
1984	709	3508	9886	15335	11021	7541	6793	5000	2388	479
1985	773	3042	8259	15541	11867	7804	6801	5254	2418	466

ENROLLMENTS 1982 TO 1995 FOR: Figure 73.
VOCATIONAL STUDIES

YEARS
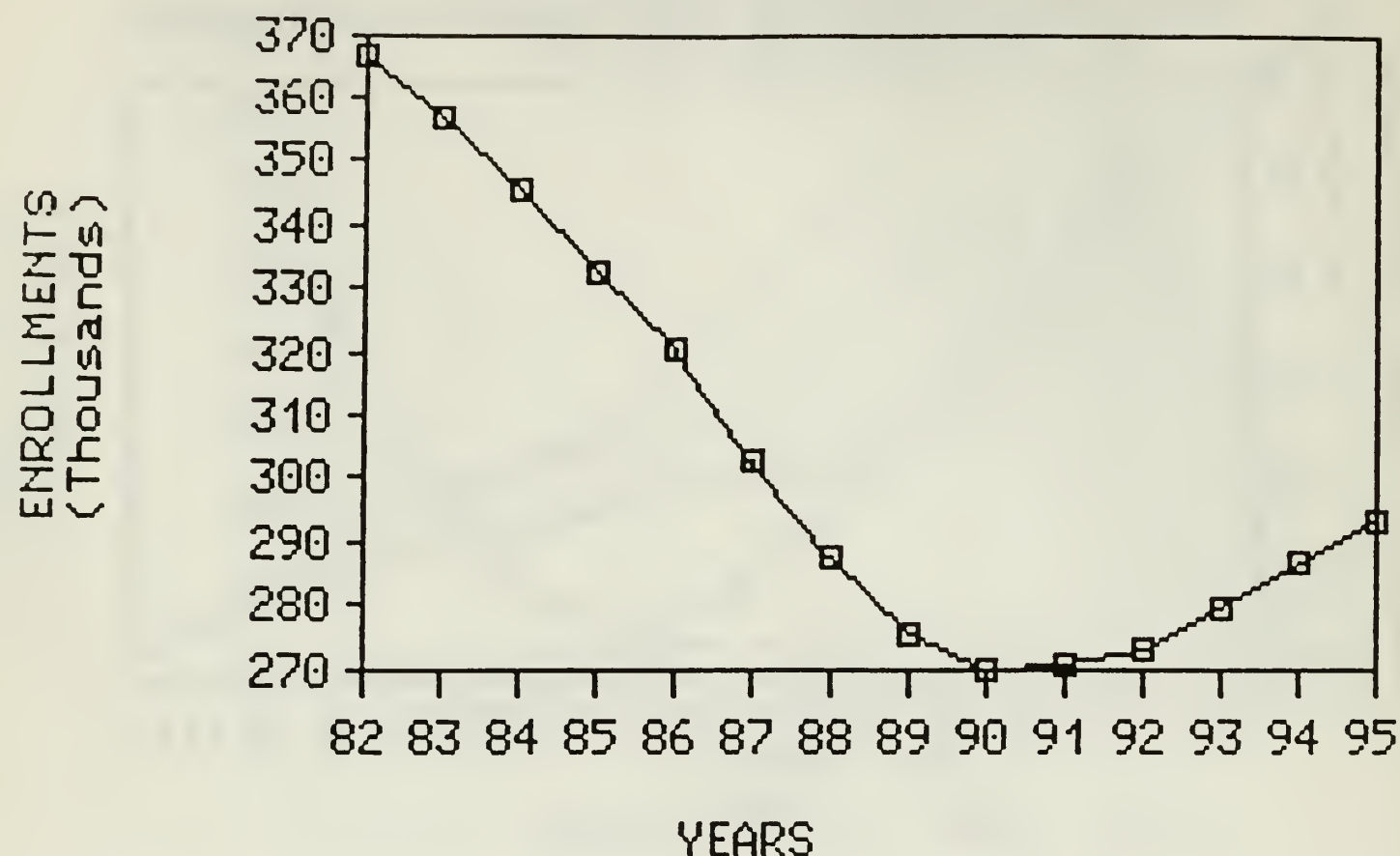
Table 8

RETENTION BY CATEGORY IN 1981
THE YEAR OF PROPOSITON 2 1/2

CATEGORIES	RETENTION
ART STUDIES	73.4
MEDIA/LIBRARIAN	76.0
OTHER LANGUAGES	78.3
FRENCH	79.6
VOCATIONAL STUDIES	79.7
HEALTH STUDIES	81.1
BILINGUAL	81.8
SPANISH	82.9
COUNSELING	83.8
ELEMENTARY & MIDDLE	85.3
GENERAL SCIENCE	85.6
ENGLISH	86.3
SOCIAL STUDIES	86.3
SPECIAL EDUCATION	87.9
MATHEMATICS	88.4
BIOLOGY	89.1
ADMINISTRATOR	89.2
EARLY CHILDHOOD	89.4
PHYSICS	89.7
CHEMISTRY	90.2

ENROLLMENTS 1982 TO 1995 FOR:
SPECIAL EDCUATION
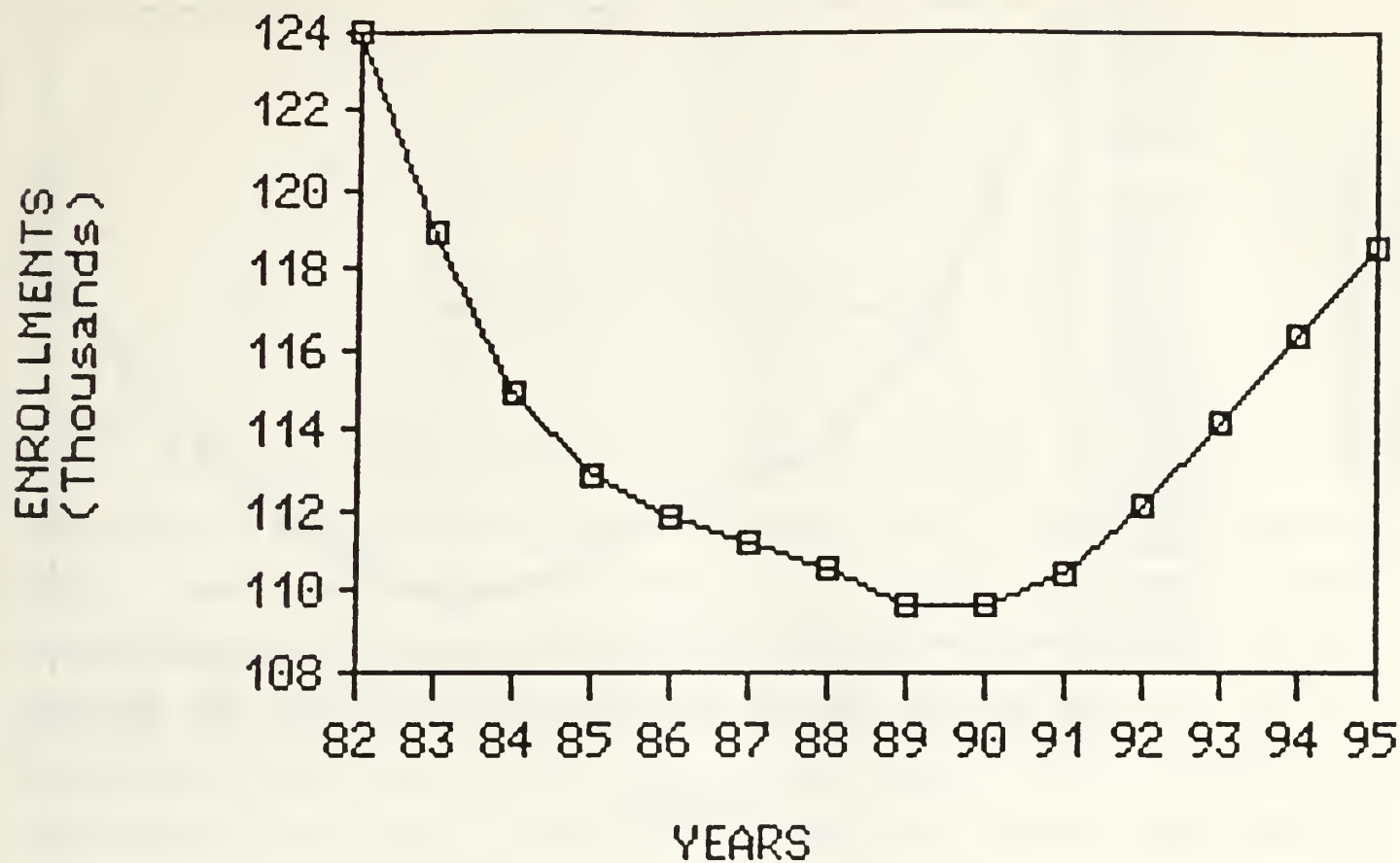
Figure 59.

ENROLLMENTS 1982 TO 1995 FOR:
EARLY CHILDHOOD

Figure 60.
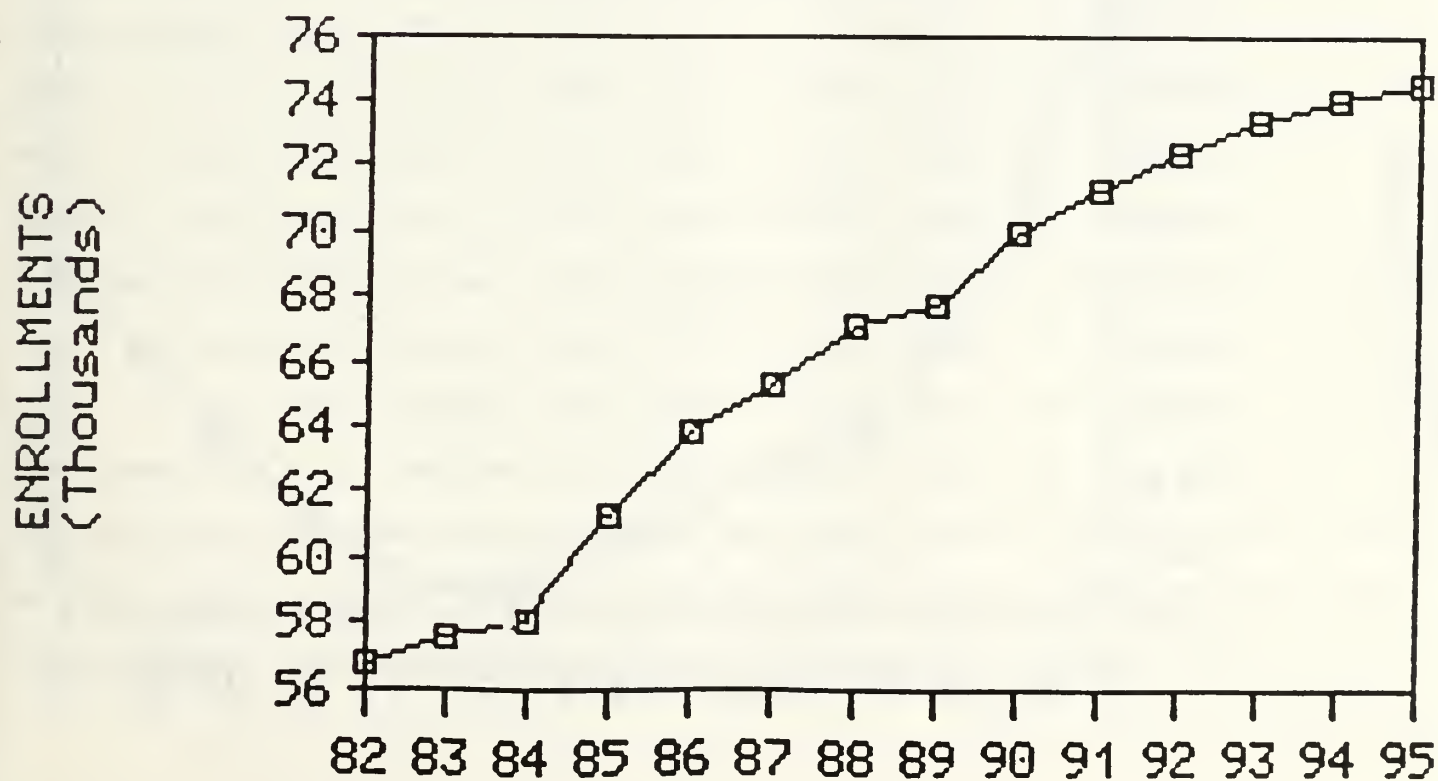
ENROLLMENTS 1982 TO 1995 FOR:
ADMINISTRATORS, COUNSELORS, MEDIA/LIB.

Figure 57.

YEARS
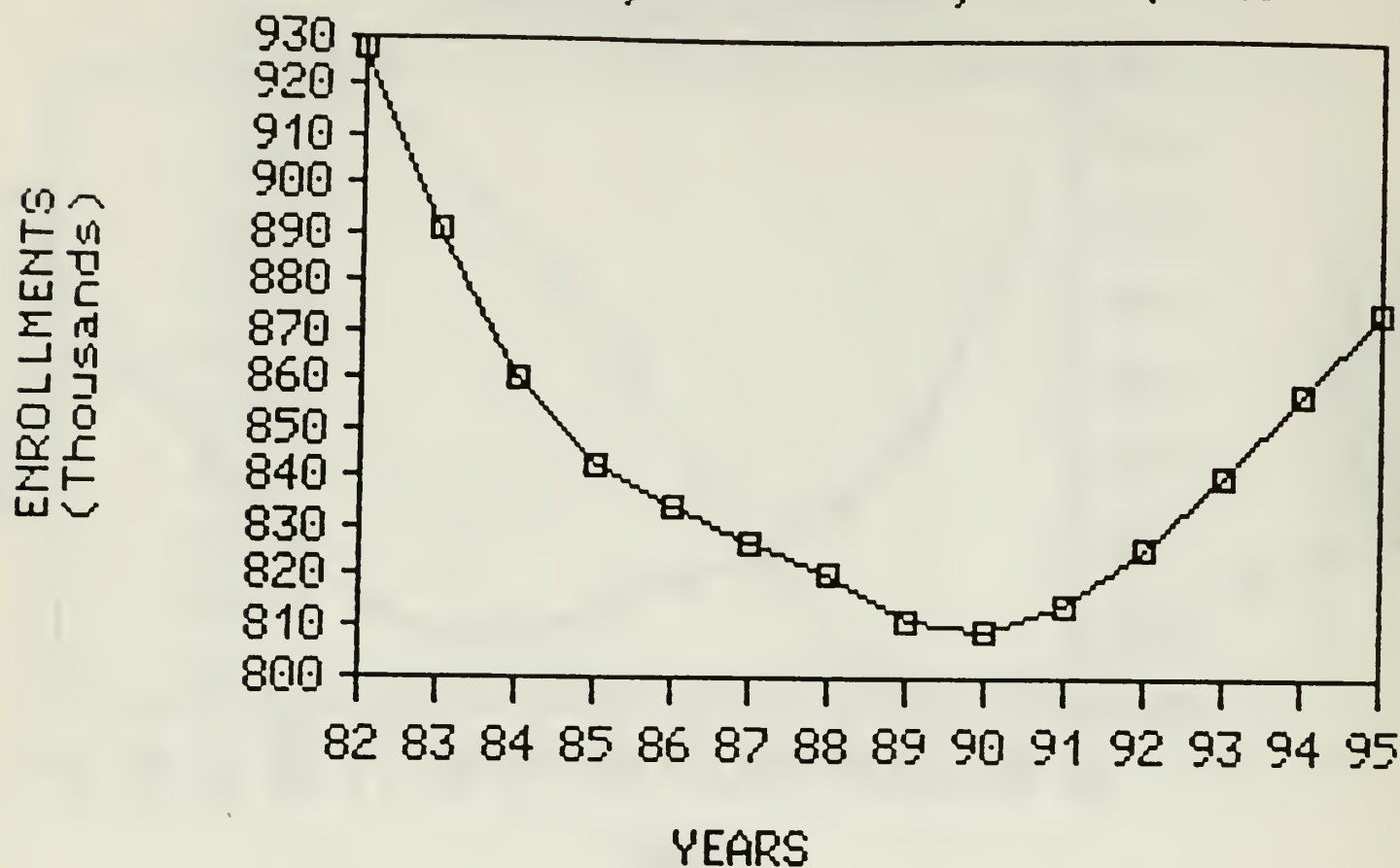
ENROLLMENTS 1982 TO 1995 FOR:
BILINGUAL

Figure 58.
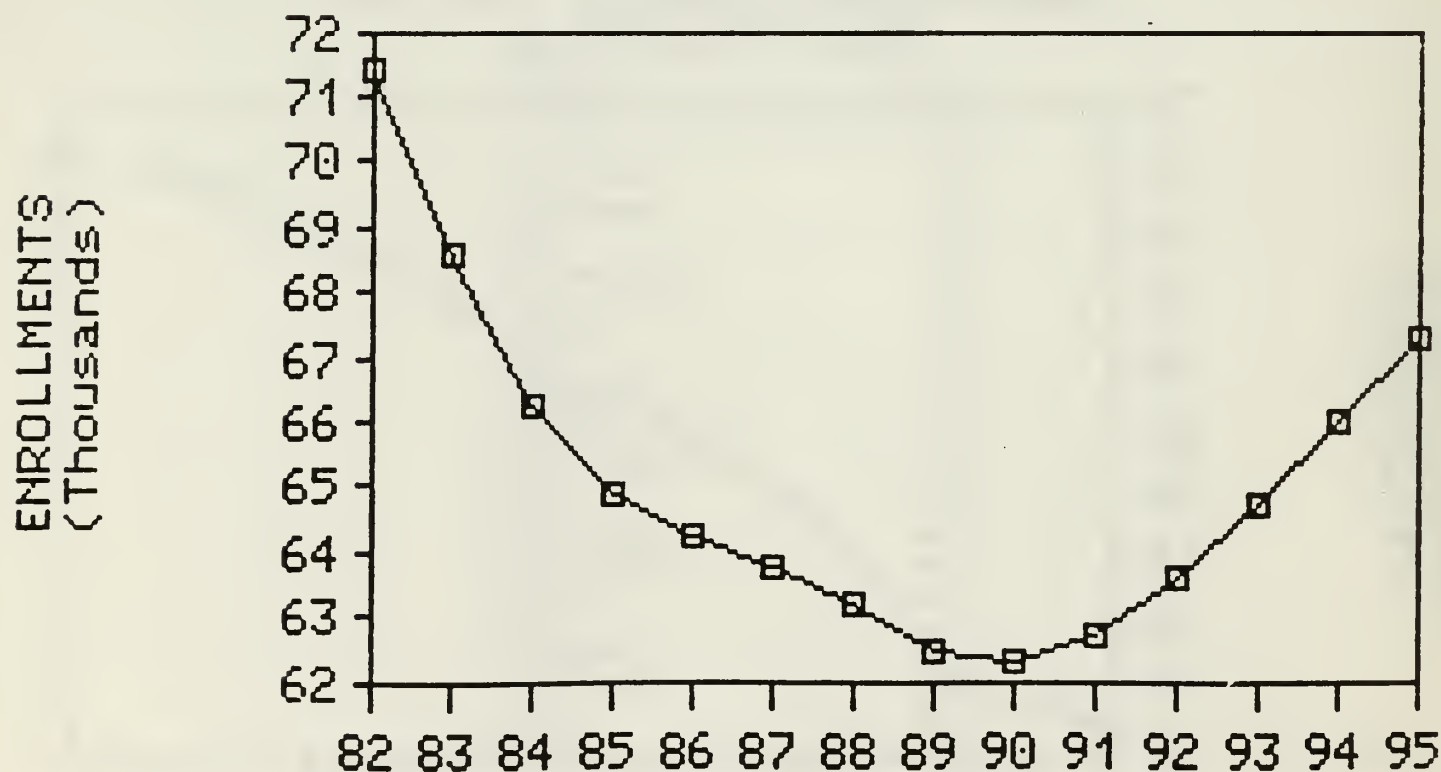
Table 7

ENROLLMENTS BY ADMINSTRATIVE AND TEACHING AREAS

CATEGORIES	1982	1983	1984	1985	1986	1987	1988	1989	1990	1931	1992	1993	1994	1995
ADMINISTRATORS	927454	890876	860780	843240	834516	827753	820742	811288	809402	814667	826034	840696	857167	874357
COUNSELING	927454	890876	860780	843240	834516	827753	820742	811288	809402	814667	826034	840696	857167	874357
MEDIA/LIBRARIAN	927454	890876	860780	843240	834516	827753	820742	811288	809402	814667	826034	840696	857167	874357
BILINGUAL	71414	68597	66280	64929	64258	63737	63197	62469	62324	62729	63605	64734	66002	67325
SPECIAL EDUCATI	123973	118995	114977	112847	111882	111234	110601	109669	109664	110508	112147	114154	116359	118636
EARLY CHILDHOOD	56801	57580	58066	61396	63928	65333	67077	67814	70001	71280	72446	73409	74045	74618
ELEMENTARY & MI	417289	395524	380410	374878	372939	376724	383776	393180	401851	410831	421082	429900	438205	445673
ENGLISH	477229	461166	445197	428767	417764	404465	387731	367748	355031	350451	350801	356183	364103	373643
MATHEMATICS	340497	327739	318719	311021	305011	292086	276363	260435	249924	246060	248030	251382	257550	264092
GENERAL SCIENCE	234449	229898	224969	213796	197699	184530	175531	171615	171907	175984	179804	184654	188698	194325
BIOLOGY	72749	69793	66416	65770	68830	65122	60558	55663	53116	51595	51284	52561	54532	54713
PHYSICS	15535	14802	13891	13479	13451	13869	14569	13537	12461	11446	11005	10741	10714	11056
CHEMISTRY	31476	29823	28357	27363	27774	28920	28548	26418	24288	22821	22107	21822	22144	22946
SOCIAL STUDIES	398538	386607	374305	360359	348328	332165	316360	301703	294311	293397	295532	301628	308742	316478
FRENCH	44624	42729	41318	40918	40753	38971	36382	34012	32466	31697	31797	32572	33179	34009
SPANISH	44624	42729	41318	40918	40753	38971	36382	34012	32466	31697	31797	32572	33179	34009
OTHER LANGUAGES	15095	14471	14095	14015	13690	12955	12022	11325	10881	10698	10820	11139	11281	11622
HEALTH STUDIES	625992	597964	570136	547328	532583	517693	502615	486742	476212	474194	478560	487012	497350	509986
ART STUDIES	336885	321929	304776	286466	271571	261651	258273	259019	261448	267333	273349	279257	286165	29287
VOCATIONAL STUD	367062	356784	345948	332996	320554	303246	287812	275286	270023	270576	273425	279807	286598	293532

Table 5

MEAN YEARS OF COURSEWORK
BY SUBJECT AREA

COURSE	MEANS YEARS
ENGLISH	4.2
SOCIAL STUDIES	3.2
MATH	3.2
SCIENCE	3.1
FORIEGN LANGUAGE	2.1
BUSINESS	2.2
INDUSTRIAL ARTS	0.8
HOME ECONOMICS	0.5
MUSIC	0.5
ART	0.4
COMPUTER SCIENCE	0.4
OTHER	0.2

Table 6

GRADE AND CATEGORY PARTICIPATION MATRIX

CATEGORIES	K	1	2	3	4	5	6	7	8	9	10	11	12
ADMINISTRATOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
COUNSELING	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MEDIA/LIBRARIAN	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BILINGUAL	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
SPECIAL EDUCATIO	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.12	0.12	0.12	0.12	0.12	0.12
EARLY CHILDHOOD	1.00	-	-	-	-	-	-	-	-	-	-	-	-
ELEMENTARY & MID	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	-	-	-	-
ENGLISH	-	-	-	-	-	-	-	1.00	1.00	1.00	1.00	1.00	1.00
MATHEMATICS	-	-	-	-	-	-	-	1.00	1.00	1.00	1.00	0.75	0.50
GENERAL SCIENCE	-	-	-	-	-	-	-	1.00	1.00	0.9	0.05	-	-
BIOLOGY	-	-	-	-	-	-	-	-	-	-	0.75	0.1	0.05
PHYSICS	-	-	-	-	-	-	-	-	-	-	-	-	0.2
CHEMISTRY	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2
SOCIAL STUDIES	-	-	-	-	-	-	-	1.00	1.00	1.00	1.00	0.5	0.5
FRENCH	-	-	-	-	-	-	-	-	-	0.2	0.2	0.1	0.05
SPANISH	-	-	-	-	-	-	-	-	-	0.2	0.2	0.1	0.05
OTHER LANGUAGES	-	-	-	-	-	-	-	-	-	0.1	0.05	0.025	0.01
HEALTH STUDIES	-	-	-	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ART STUDIES	-	-	-	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
VOCATIONAL STUDI	-	-	-	-	-	-	-	1.00	1.00	1.00	1.00	0.3	0.3

Figure 51.

BUSINESS

x of students

MEAN = 2.2 YEARS

YEARS OF COURSEWORK

Figure 52.

ENGLISH

x of students

MEAN = 4.2 YEARS

YEARS OF COURSEWORK
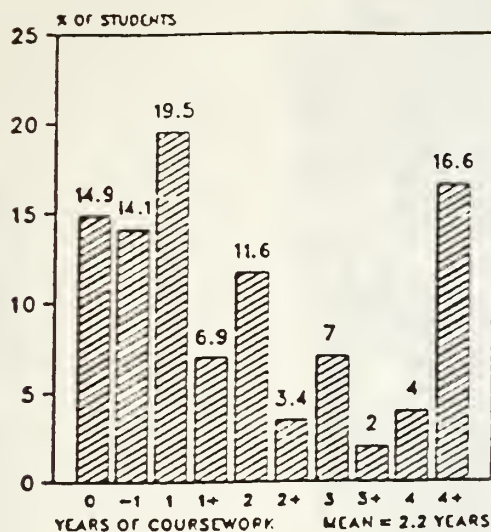
Figure 53.

FOREIGN LANGUAGE

x of students

YEARS OF COURSEWORK   MEAN = 2.1 YEARS

Figure 54.

MATH

x of students

YEARS OF COURSEWORK   MEAN = 3.2 YEARS
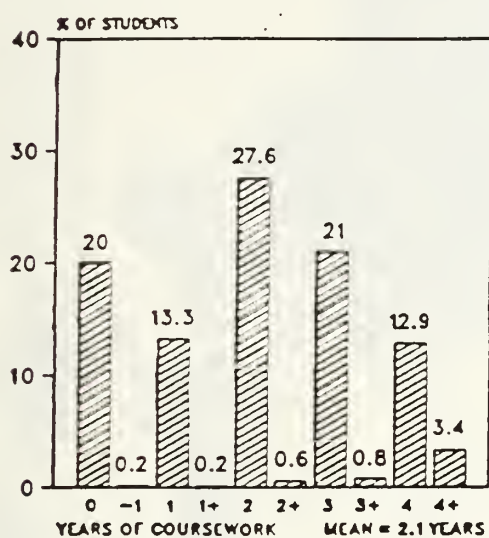
Figure 55.

SOCIAL STUDIES
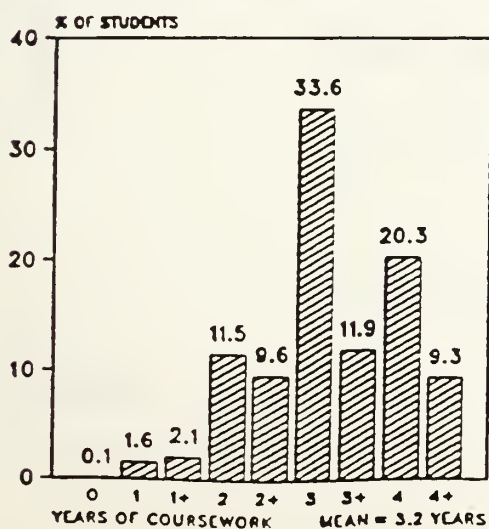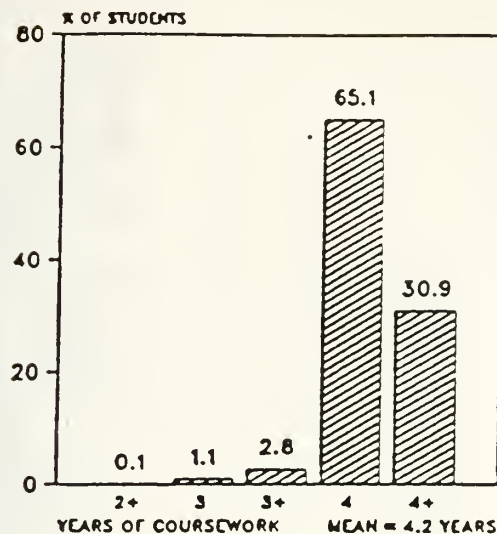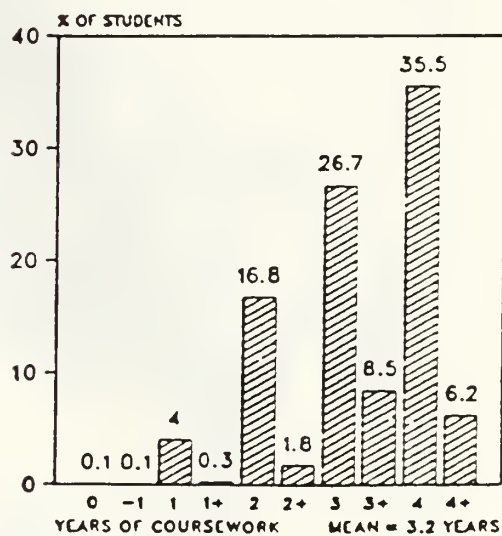
x of students

YEARS OF COURSEWORK   MEAN = 3.2 YEARS

Figure 56.

SCIENCE

x of students

YEARS OF COURSEWORK   MEAN = 3.1 YEARS
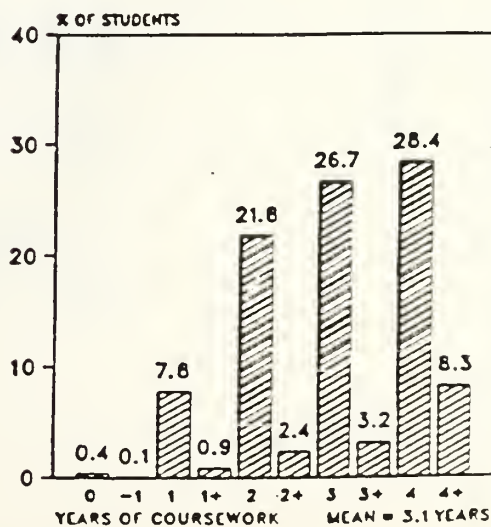
SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT

CHANGE 90 - 95

]... , -25%]
]-25 , -15%]
]-15 , -5%]
]-5 , +5%]
]+5 , +15%]
]+15 , ...%]
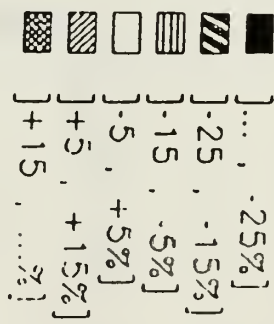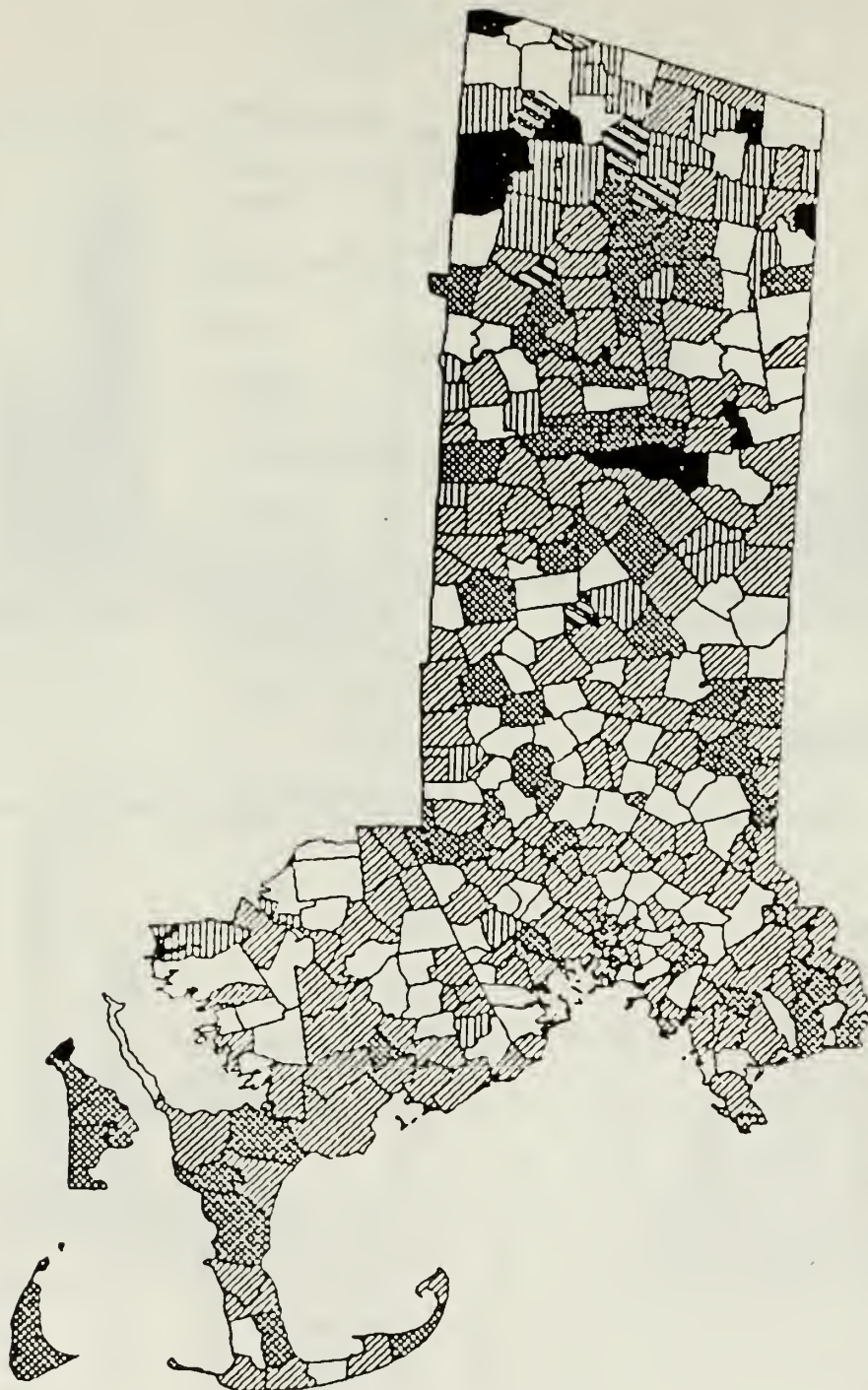
Figure 50.

SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT
CHANGE 85 - 90

... , -25%]
-25 , -15%]
-15 , -5%]
-5 , +5%]
+5 , +15%]
+15 , ...%]
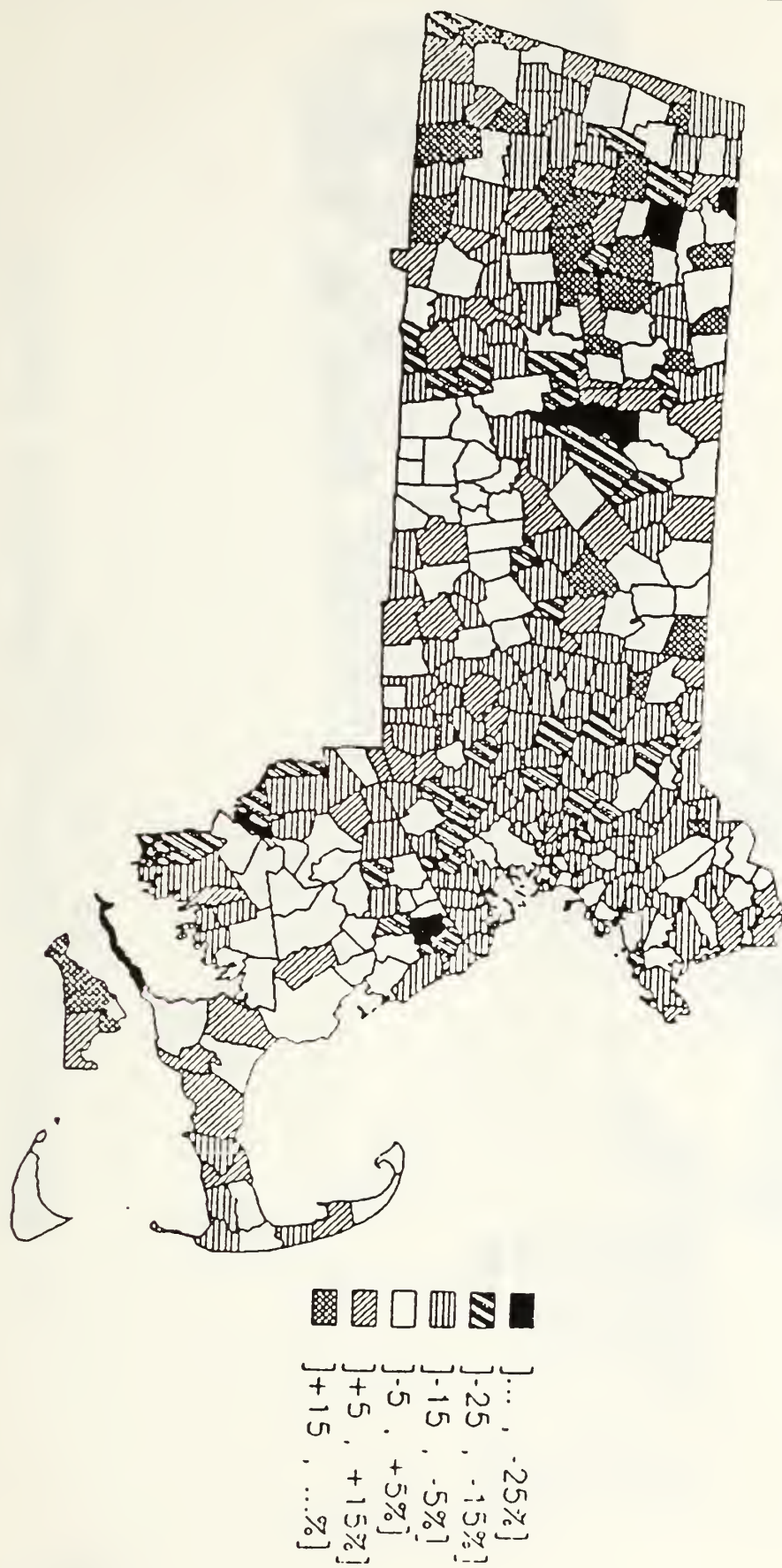
Figure 49.

SCHOOL ATTENDING CHILDREN: GRADES 7 - 12

CHANGE 90 · 95

... , -25%]
-25 , -15%]
-15 , -5%]
-5 , +5%]
+5 , +15%]
+15 , ...%]
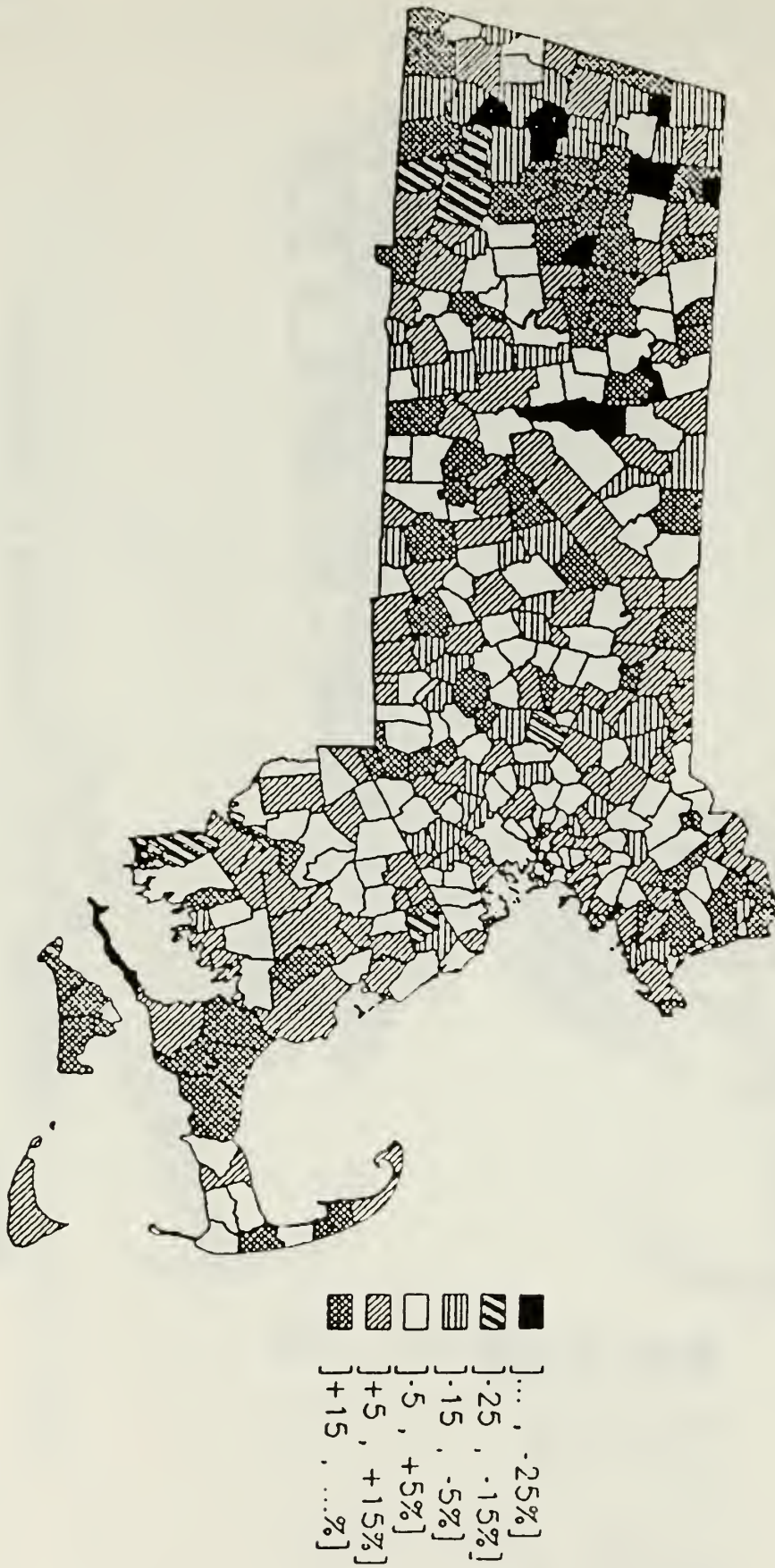
Figure 48.

SCHOOL ATTENDING CHILDREN: GRADES 7 - 12
CHANGE 85 - 90

].., -25%]
]-25 , -15%]
]-15 , -5%]
]-5 , +5%]
]+5 , +15%]
]+15 , ...%[
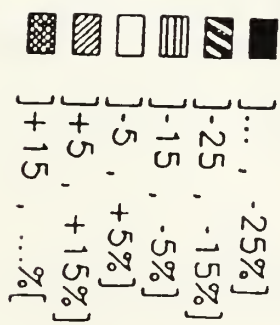
Figure 47.

SCHOOL ATTENDING CHILDREN: GRADES K - 6
CHANGE 90 - 95

... , -25%]
]-25 , -15%]
]-15 , -5%]
]-5 , +5%]
]+5 , +15%]
]+15 , ...[
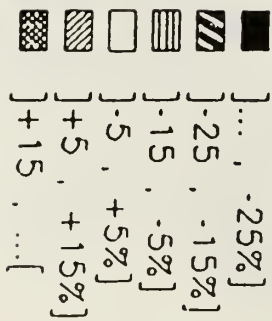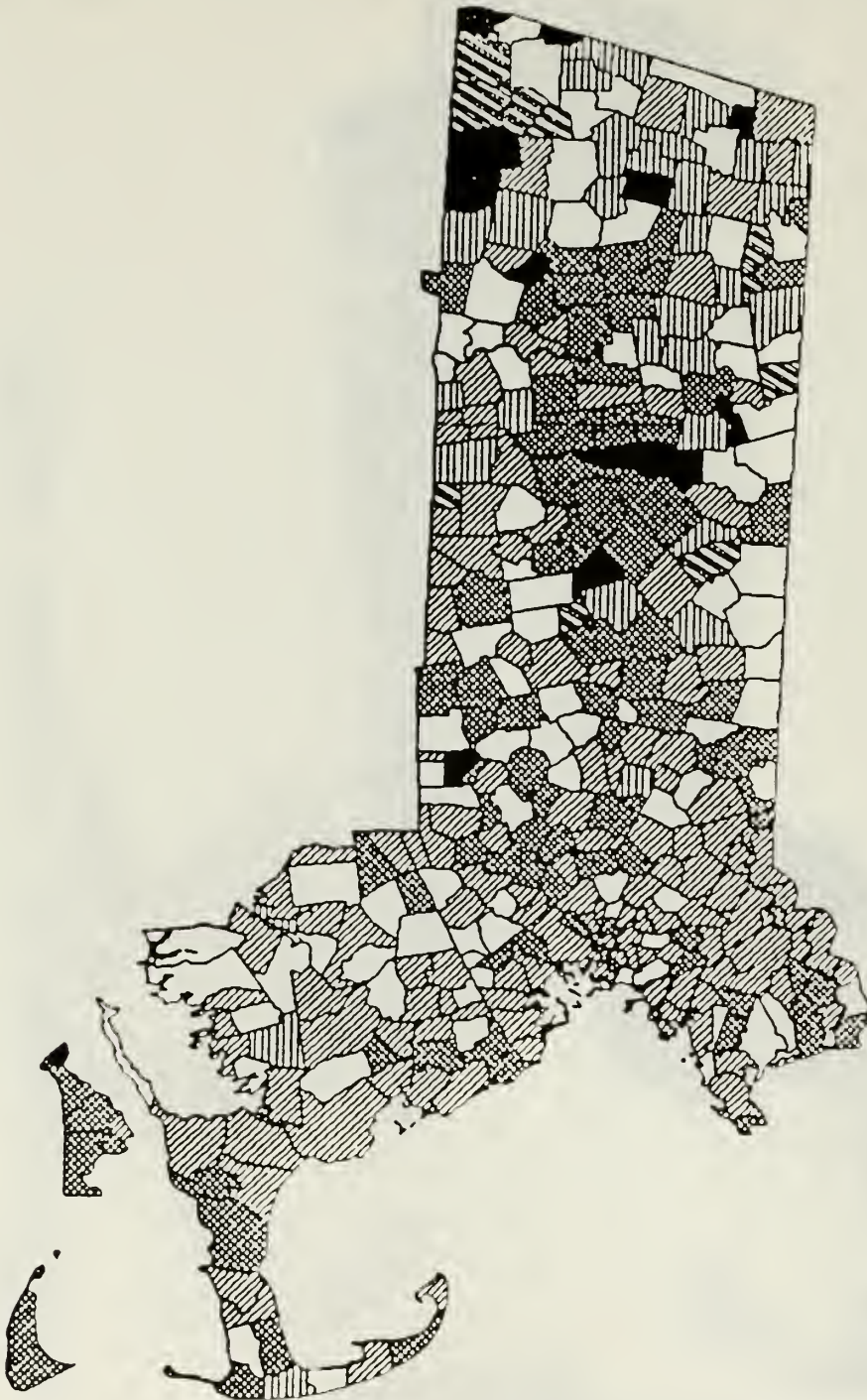
Figure 46.

SCHOOL ATTENDING CHILDREN: GRADES K - 6
CHANGE 85 - 90

	... , -25%]
	]-25 , -15%]
	]-15 , -5%]
	]-5 , +5%]
	]+5 , +15%]
	]+15 , ...%[

Figure 45.
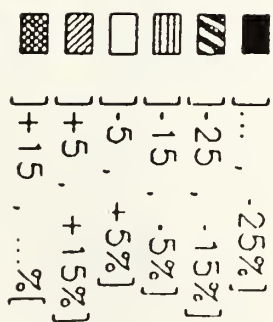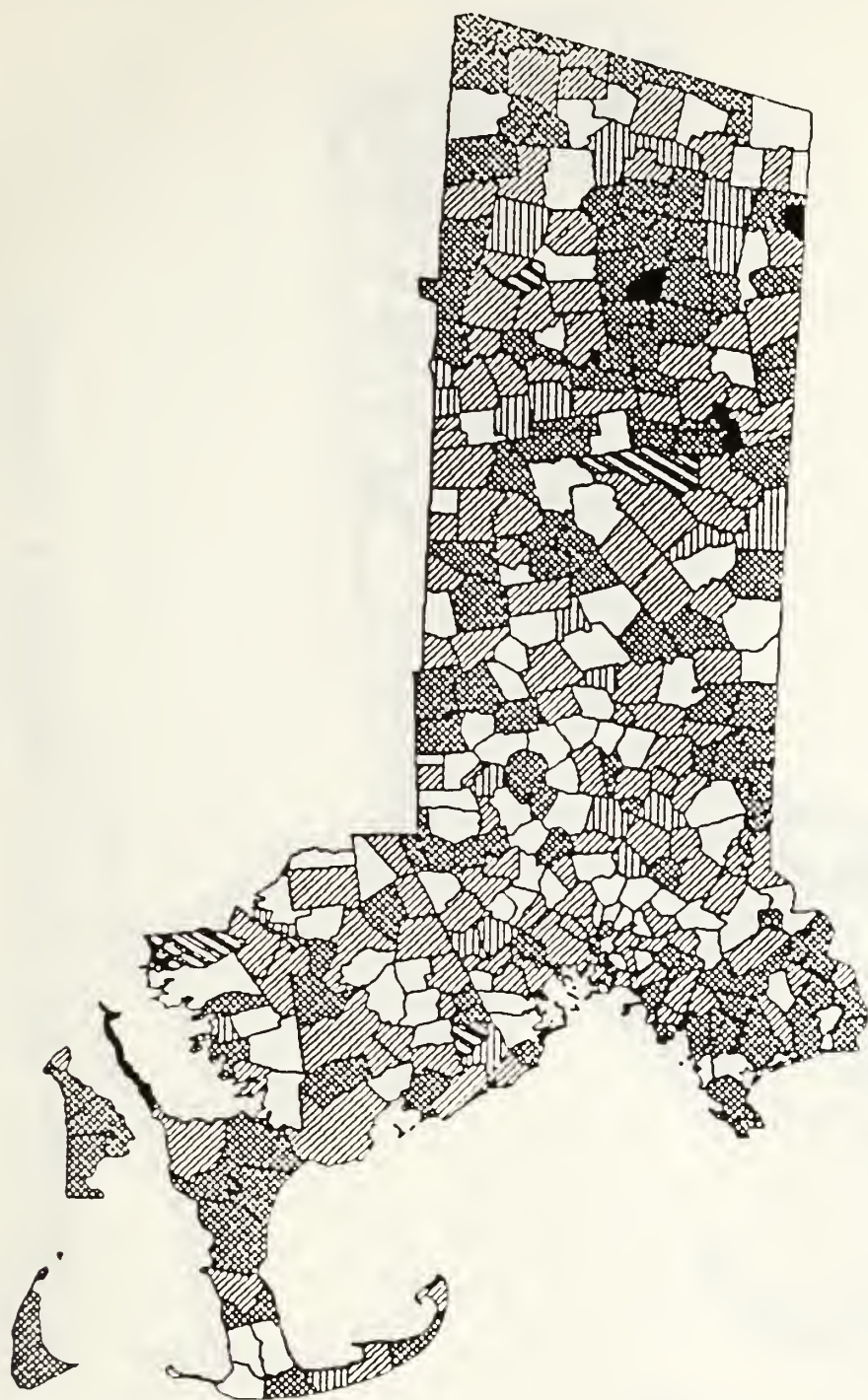
SCHOOL ATTENDING CHILDREN: GRADES 7 - 12
CHANGE 90 - 95
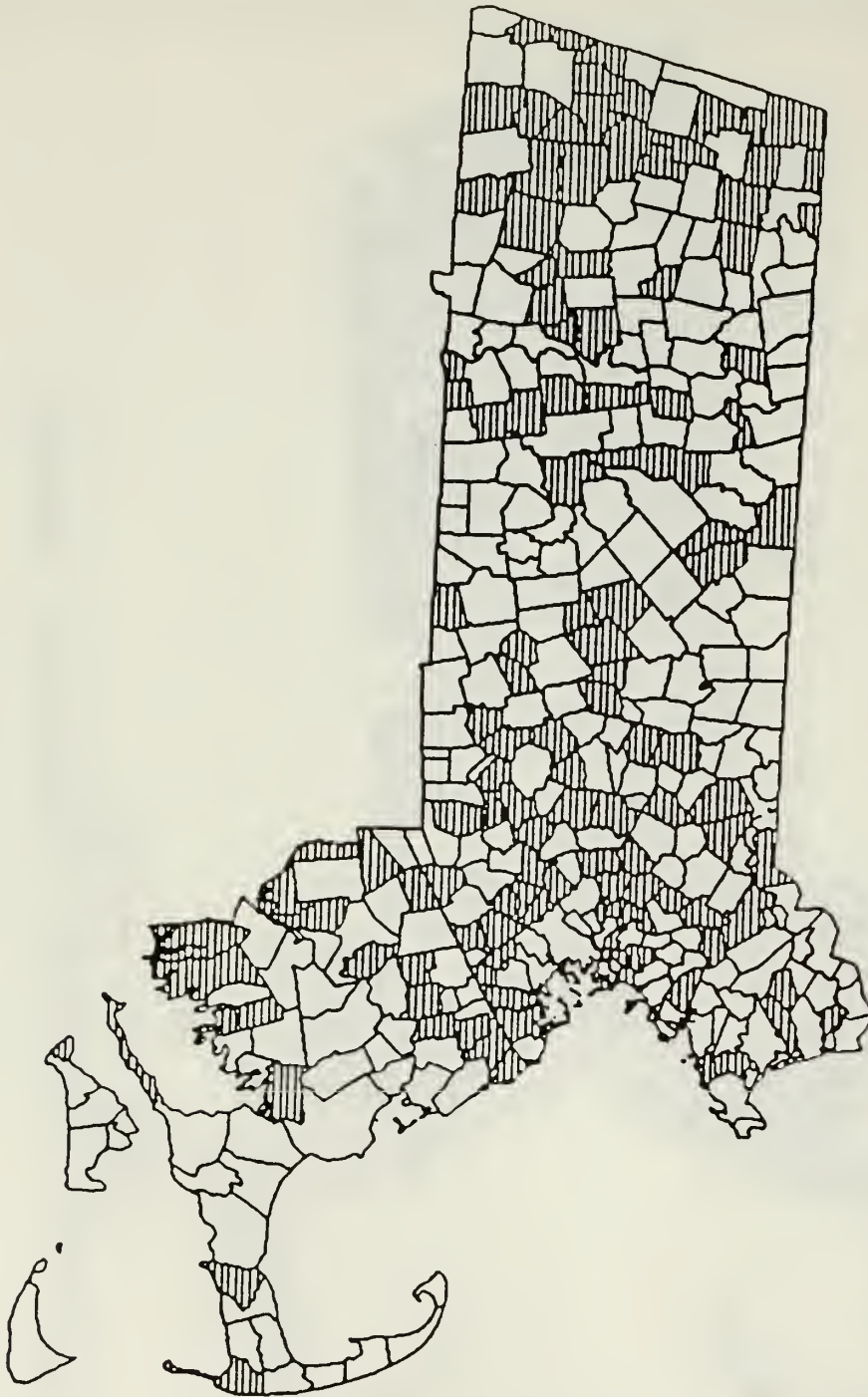
decrease (128 schools)
increase (223 schools)

Figure 44.

SCHOOL ATTENDING CHILDREN: GRADES 7 - 12
CHANGE 85 - 90

decrease (321 schools)
increase (30 schools)

Figure 43.

SCHOOL ATTENDING CHILDREN: GRADES K - 6
CHANGE 90 - 95
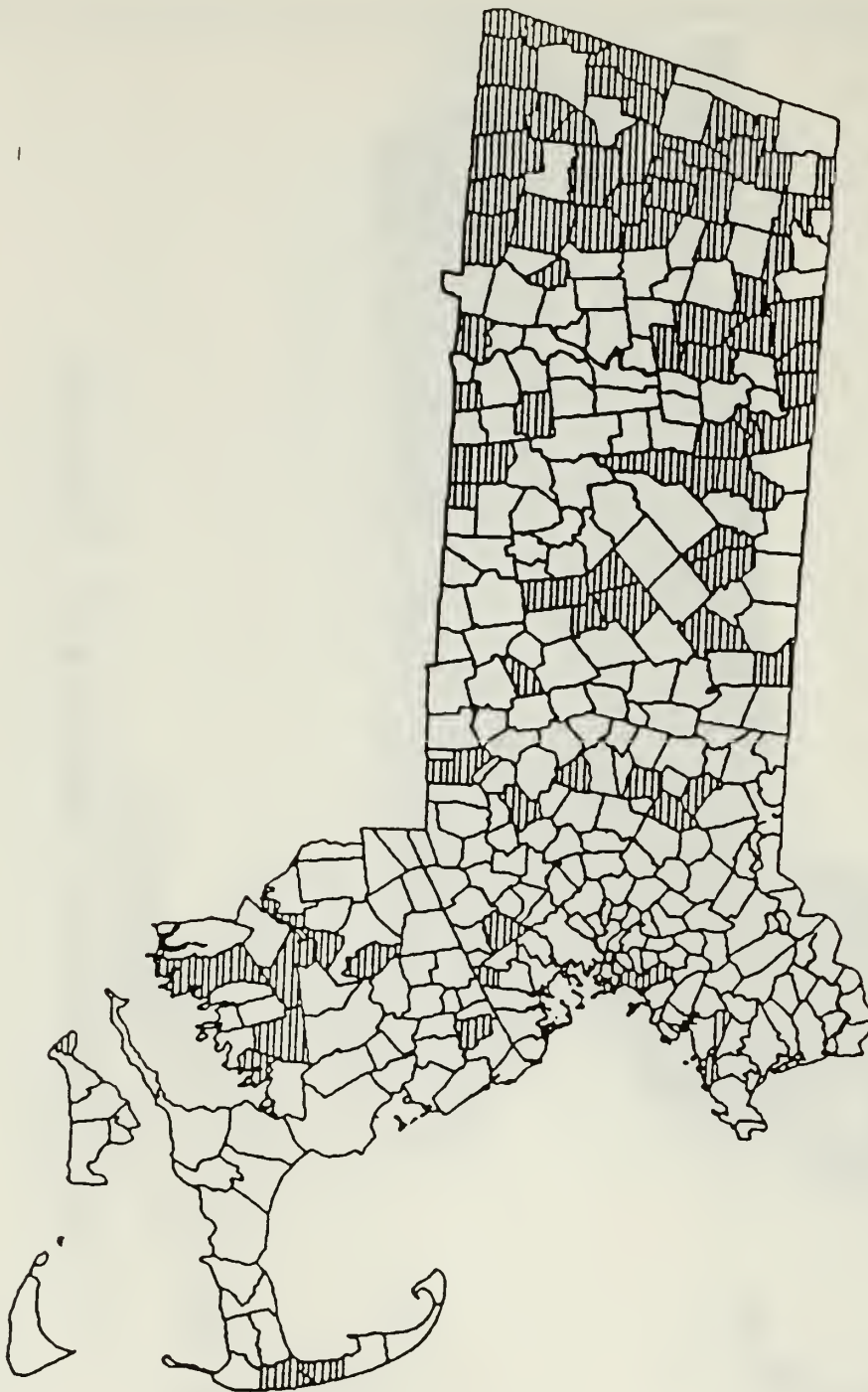
decrease (86 schools)
increase (265 schools)

Figure 42.

SCHOOL ATTENDING CHILDREN: GRADES K - 6
CHANGE 85 - 90
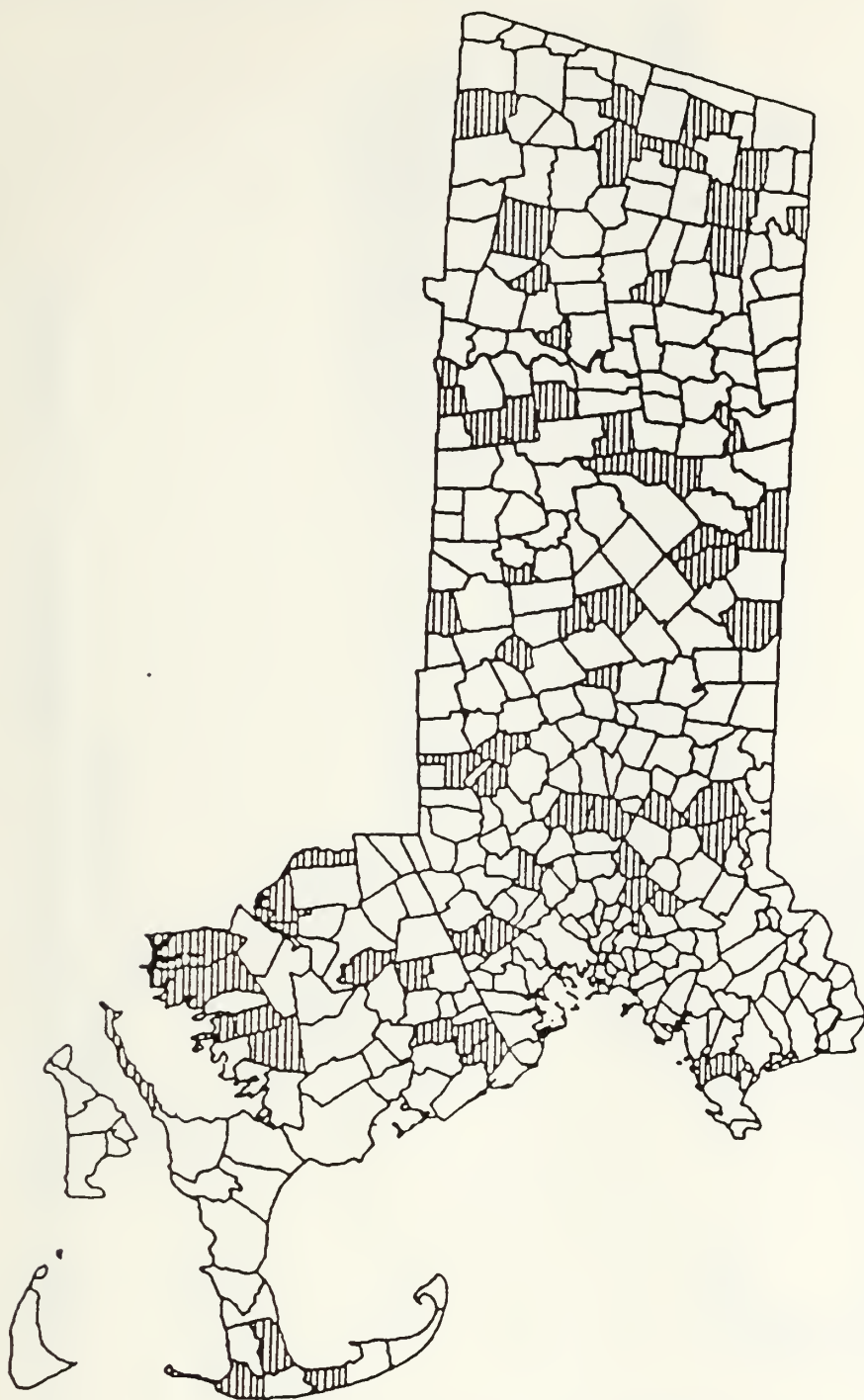
decrease (66 schools)
increase (285 schools)

Figure 41.

SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT

CHANGE 90 - 95

decrease (73 schools)

increase (278 schools)
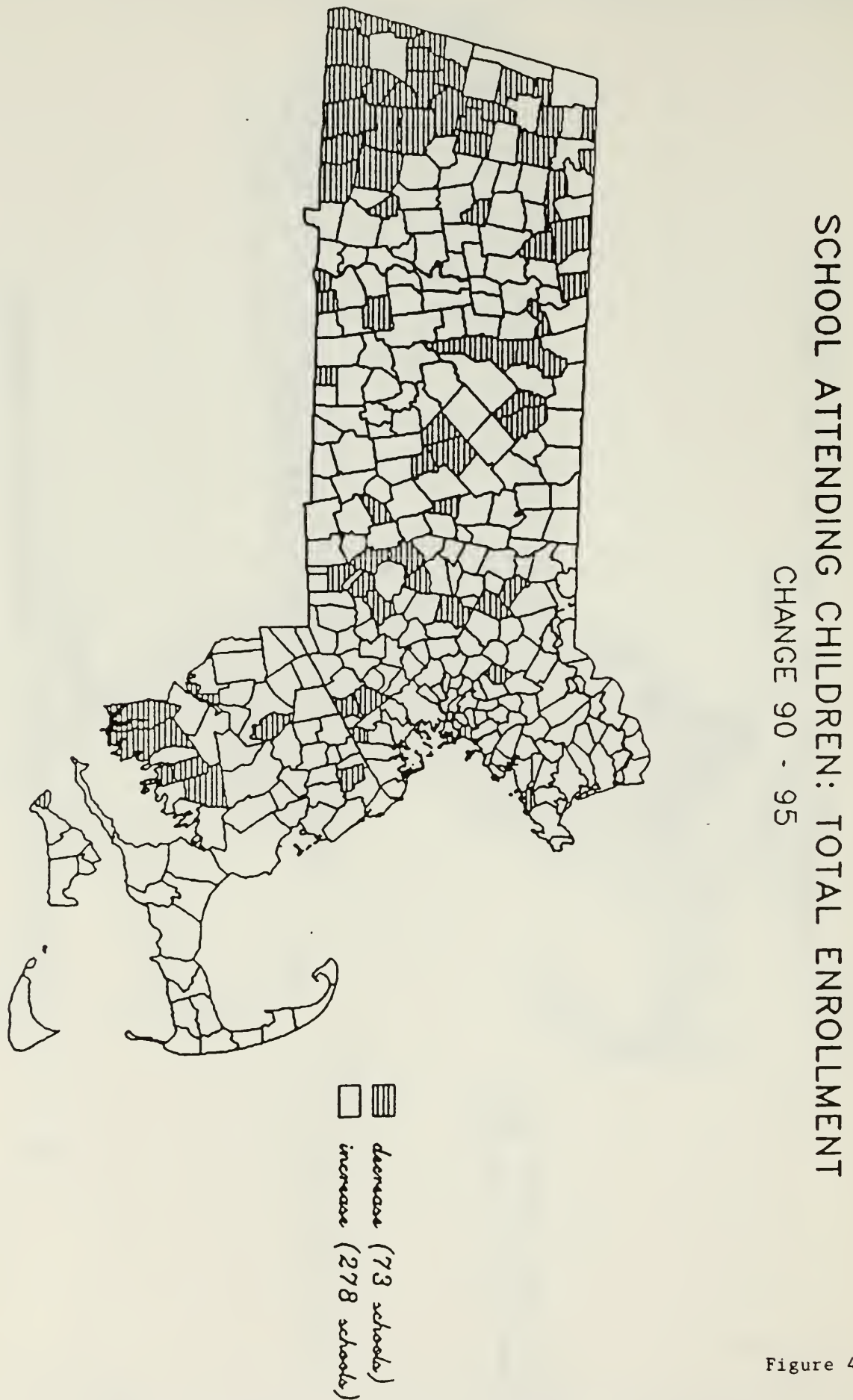
Figure 40.

SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT
CHANGE 85 - 90

decrease (232 schools)
increase (119 schools)

Figure 39.

SCHOOL ATTENDING CHILDREN: GRADES 7 - 12
CHANGE 80 - 85

	... . -25%]
	-25 . -15%]
	-15 . -5%]
	-5 . +5%]
	+5 . +15%]
	+15 . ...%]
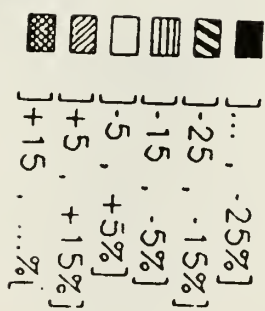
Figure 38.

SCHOOL ATTENDING CHILDREN: GRADES K - 6

CHANGE 80 - 85

]..., -25%]
]-25 , -15%]
]-15 , -5%]
]-5 , +5%]
]+5 , +15%]
]+15 , ...[
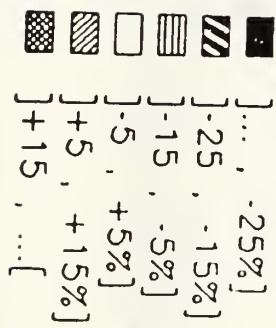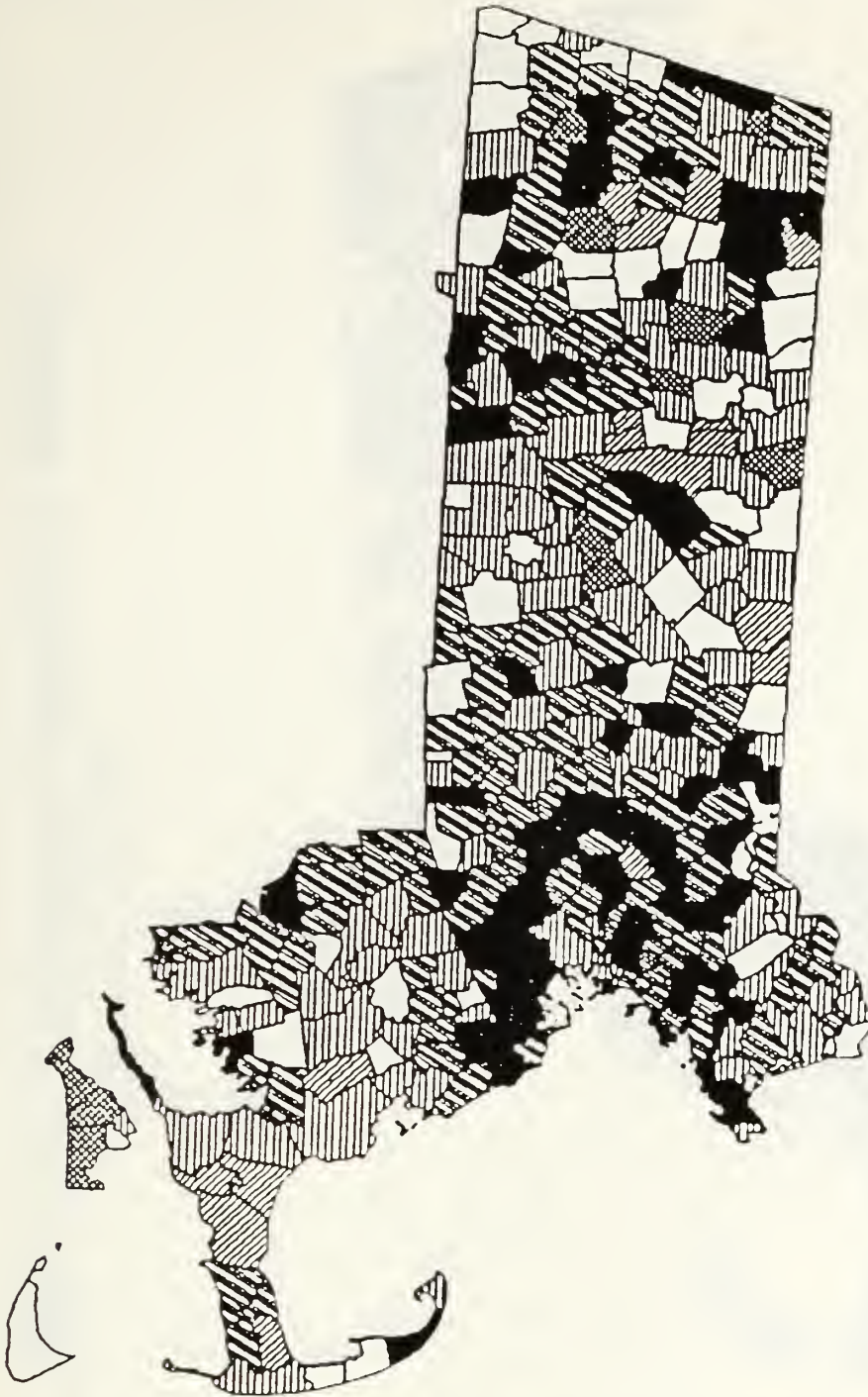
Figure 37.

SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT
CHANGE 80 - 85

```
[...  , -25%]
[-25 , -15%]
[-15 , -5%]
[-5  , +5%]
[+5  , +15%]
[+15 , ...%]
```

Figure 36

SCHOOL ATTENDING CHILDREN: GRADES 7 - 12
CHANGE 80 - 85

decrease (295 schools)
increase (56 schools)

Figure 35

SCHOOL ATTENDING CHILDREN: GRADES K - 6
CHANGE 80 - 85

decrease (302 schools)
increase (49 schools)

Figure 34

SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT

CHANGE 80 - 85

decrease (314 schools)

increase (37 schools)

Figure 33

SCHOOL ATTENDING CHILDREN: TOTAL ENROLLMENT
1985
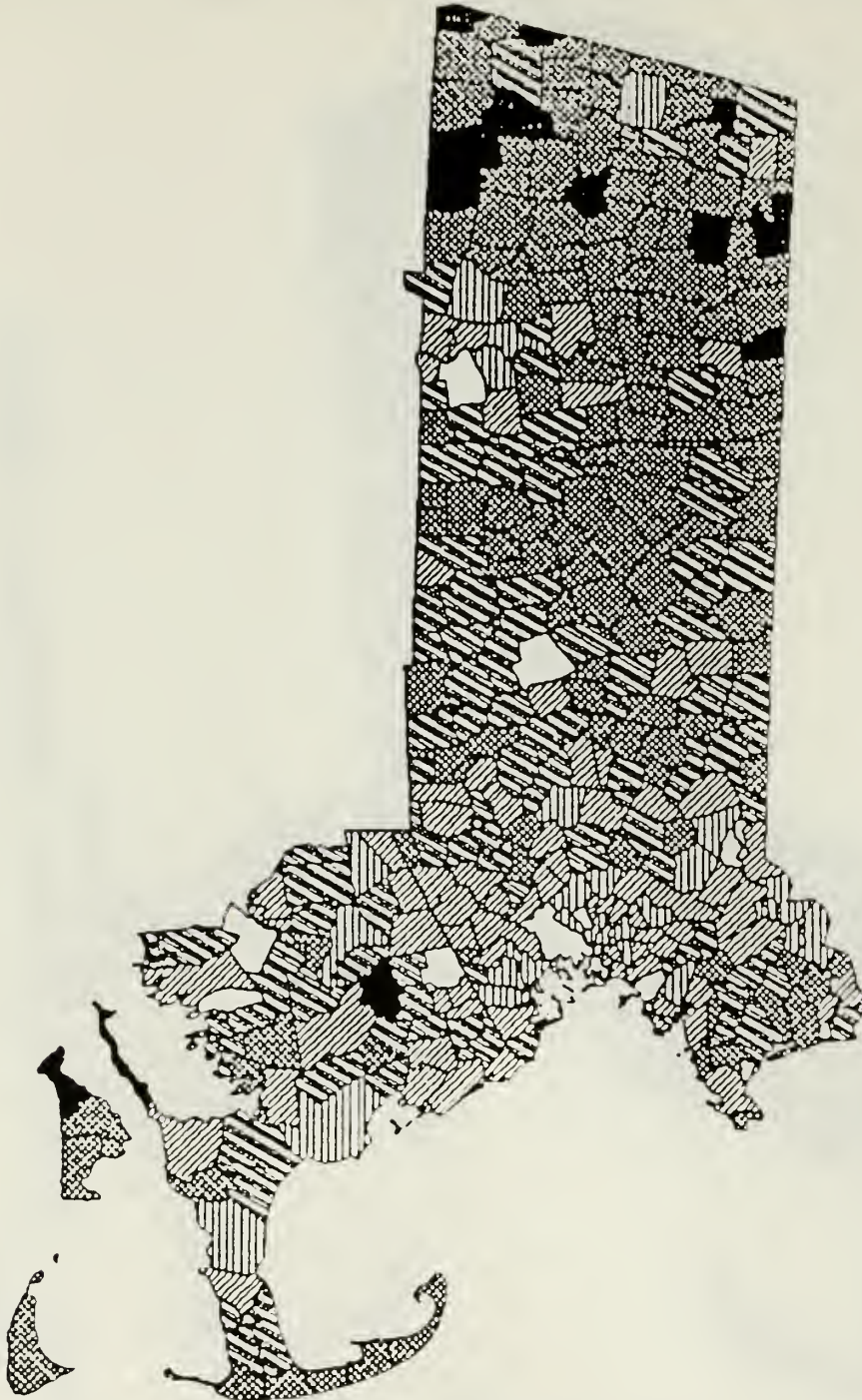
[0,100] (16)
]100 , 1,000] (26)
]1,000 , 2,500] (95)
]2,500 , 5,000] (77)
]5,000 , 10,000] (26)
]10,000 , ...[(8)

Figure 32

Table 4

PUBLIC SCHOOL ENROLLMENTS: HISTORICAL AND FORECASTED 1968-1995

YEAR	K to 6	7 to 12	TOTAL
1968	594772	458100	1052872
1969	609947	481031	1090978
1970	621752	501859	1123611
1971	631156	519358	1150514
1972	631691	537608	1169299
1973	623900	548243	1172143
1974	629147	553881	1183028
1975	617406	554623	1172029
1976	607441	560454	1167895
1977	583617	556100	1139717
1978	555378	545380	1100758
1979	529325	530963	1060288
1980	502977	512188	1015165
1981	480714	497191	977905
1982	450225	477229	927454
1983	429710	461166	890876
1984	425583	445197	870780
1985	414281	428870	843151
1986	416752	417764	834516
1987	423288	404465	827753
1988	433011	387731	820742
1989	443540	367748	811288
1990	454371	355031	809402
1991	464216	350451	814667
1992	475233	350801	826034
1993	484513	356183	840696
1994	493064	364103	857167
1995	500514	373843	874357

Table 3

Average Teacher Salary by Neighboring States

	Salary 1985	Cost of Living Adj.
U.S.	25,240	
Massachusetts	26,800	23,406
D.C.	32,067	28,837
Rhode Island	29,470	26,767
New York	30,490	25,971
Pennsylvania	26,006	25,698
Ohio	24,988	23,485
		———(Massachusetts
New Jersey	28,000	22,581
Maryland	25,861	22,076
Connecticut	26,580	21,047
Delaware	24,625	20,851
Maine	19,583	20,065
Vermont	20,379	18,990
New Hampshire	20,263	17,884

Figure 31

Total Enrollments, Primary Grades (K-6), and Secondary Grades (7-12)
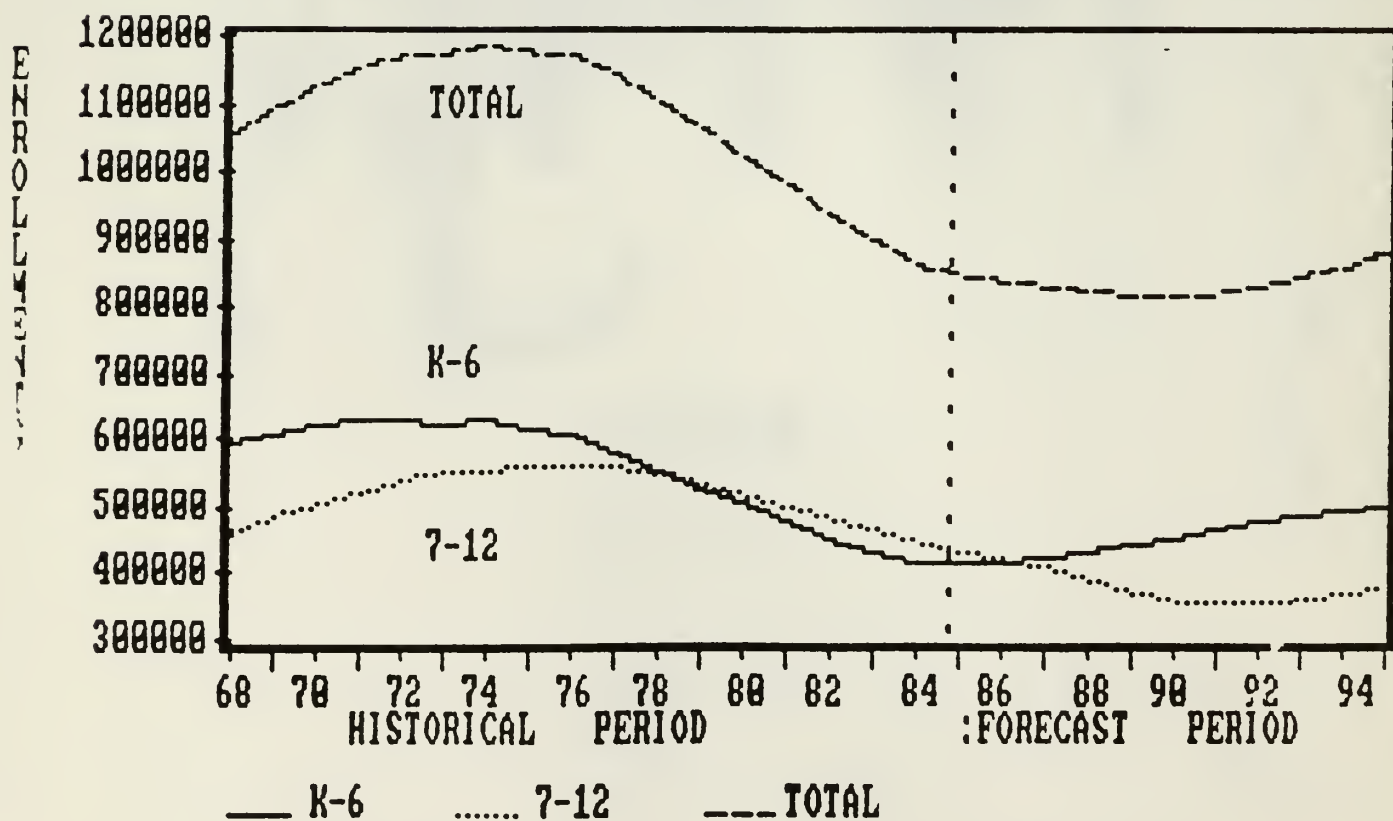
RETENTION BY AGE COHORT
1985

Figure 29

PERCENT RETAINED

AGE COHORTS
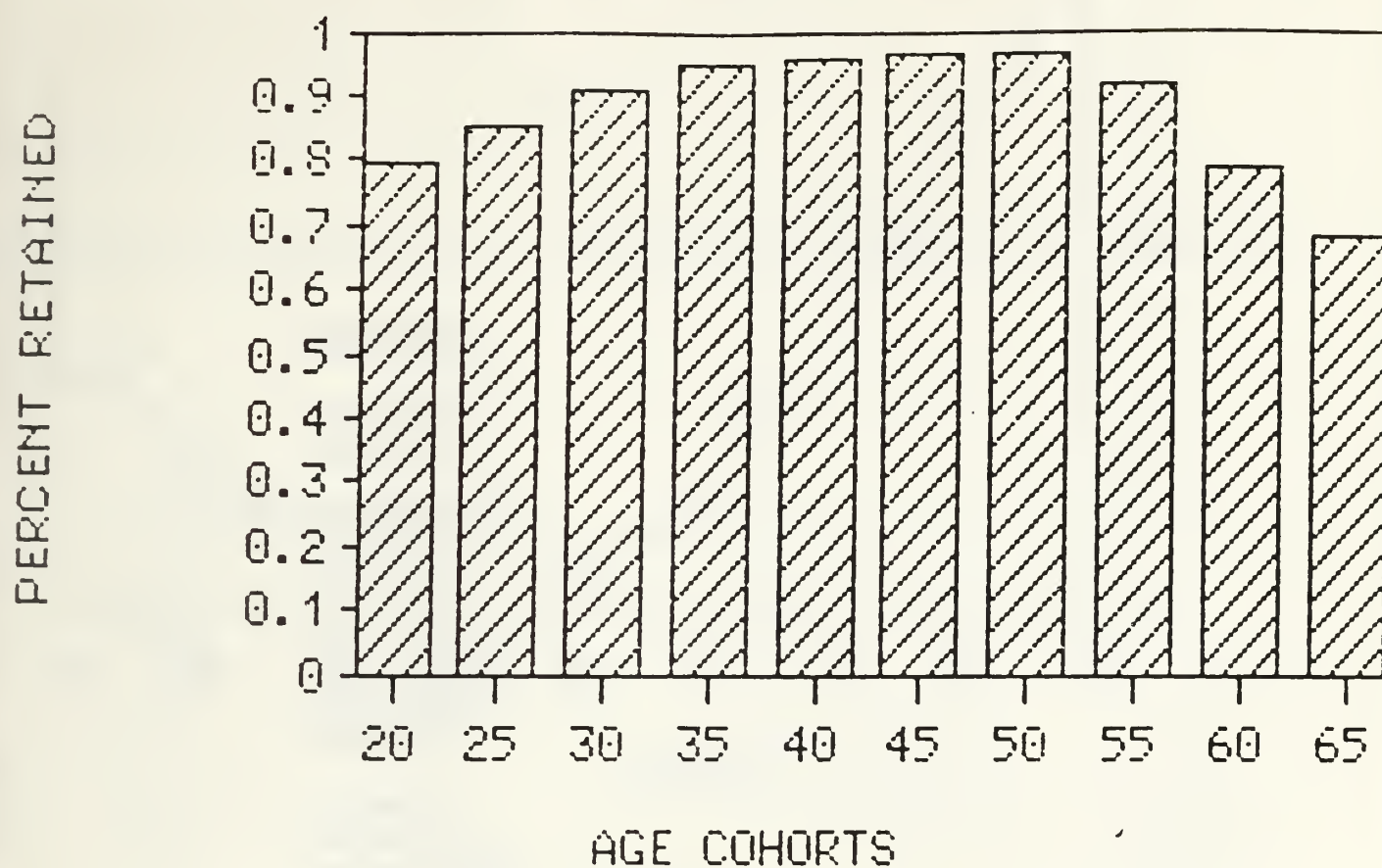
RETIREMENT BY AGE
AGES 50 TO 70

Figure 30

PERCENT RETIRED
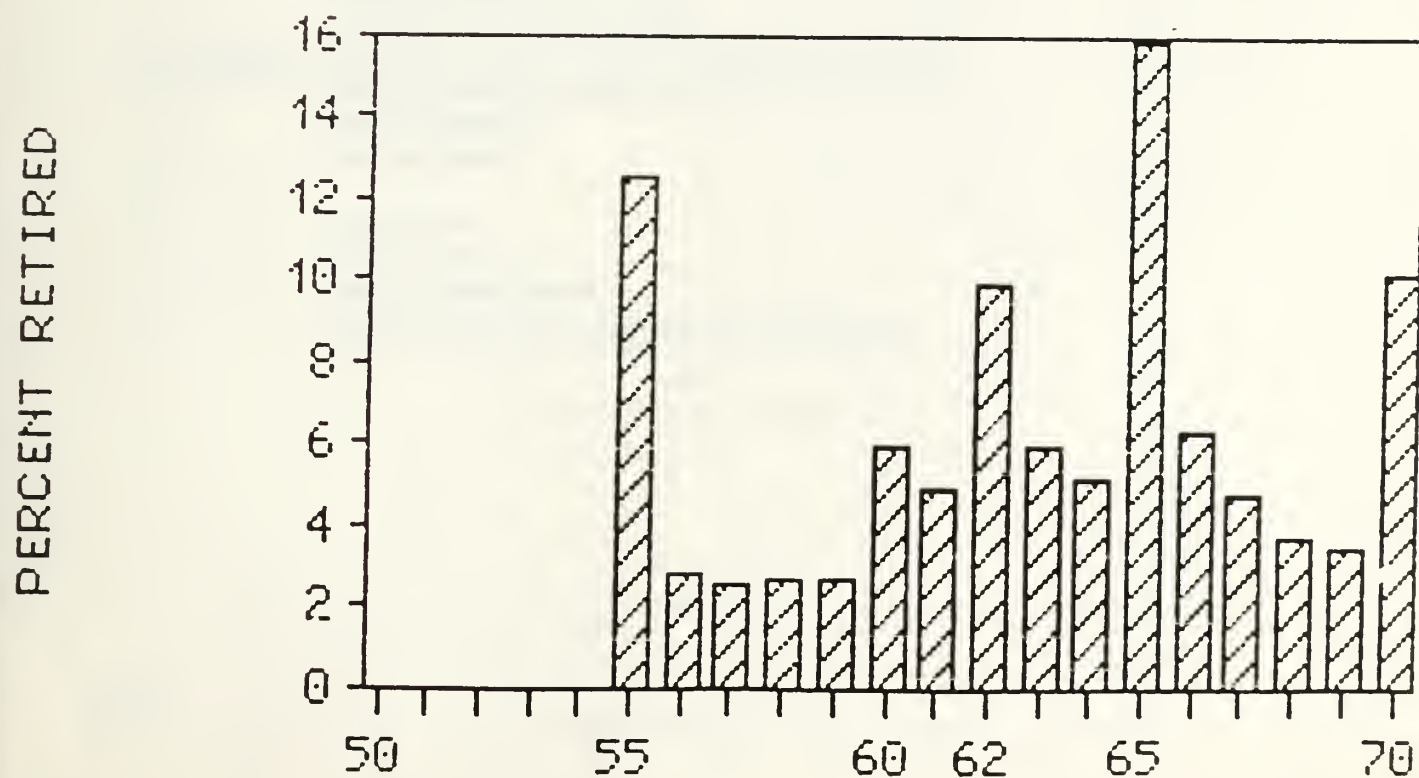
PRIVATE SCHOOL ATTENDING CHILDREN
PERCENTAGE OF TOTAL ENROLLMENTS

Figure 27

PERCENT PRIVATE ENROLLMENTS

YEARS
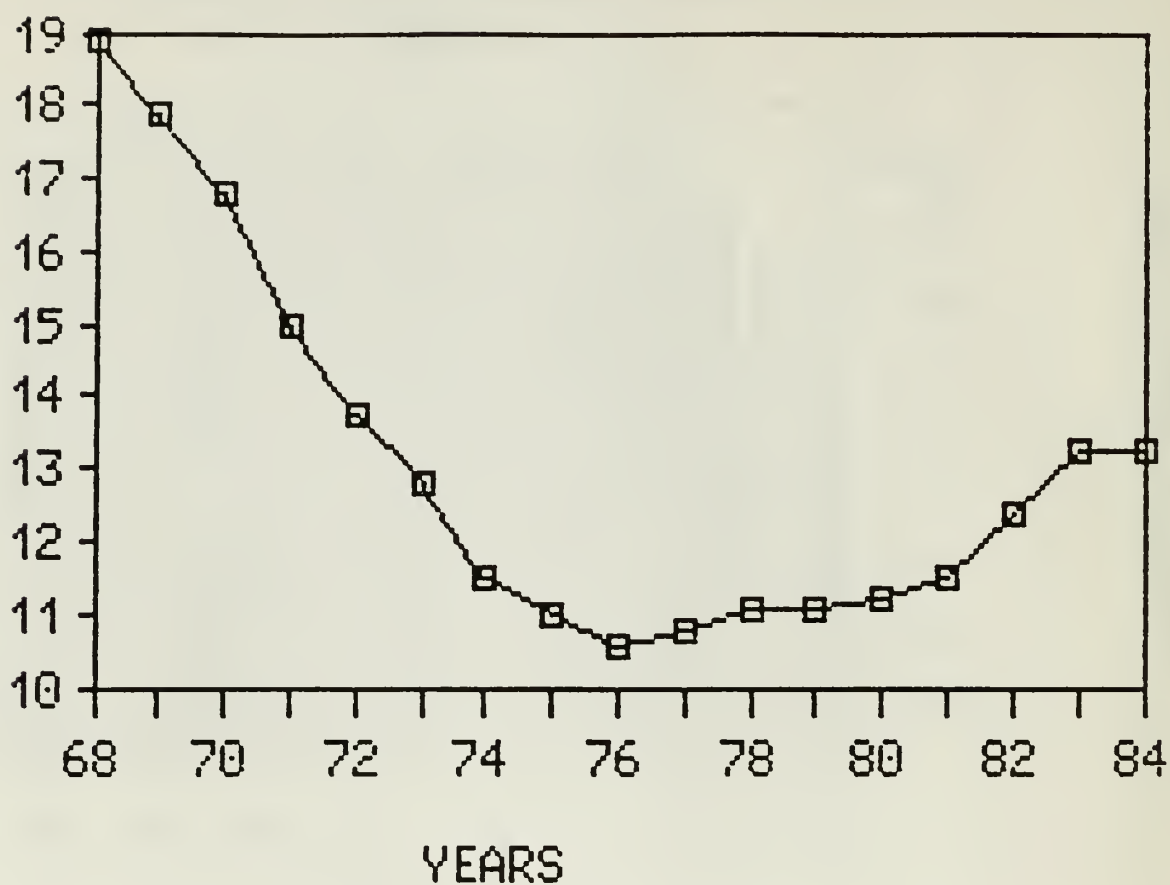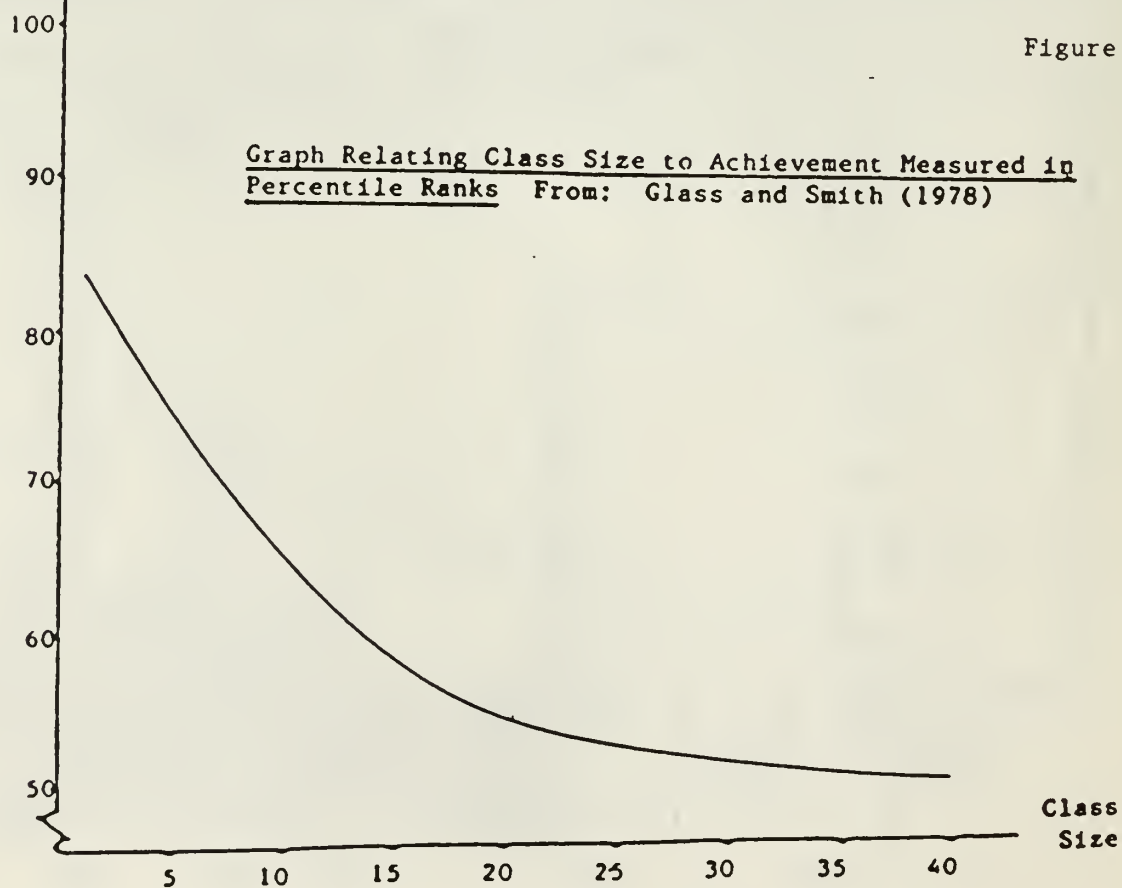
Achievement

Figure 28

Graph Relating Class Size to Achievement Measured in
Percentile Ranks   From: Glass and Smith (1978)

Class
Size

Figure 26

Reentry Rates of 1980 Public High School Sophomores

Reentrants as percent of dropouts

Figure 25

Dropouts as percent of sophomores

ENROLLMENTS AND LIVE BIRTHS

YEARS

Historical Grade 12
Enrollments
Public and Non-public

Historical Live Births
17 Years Previous

1968

1951

1985

1968

60 70 80 90 100 110 120
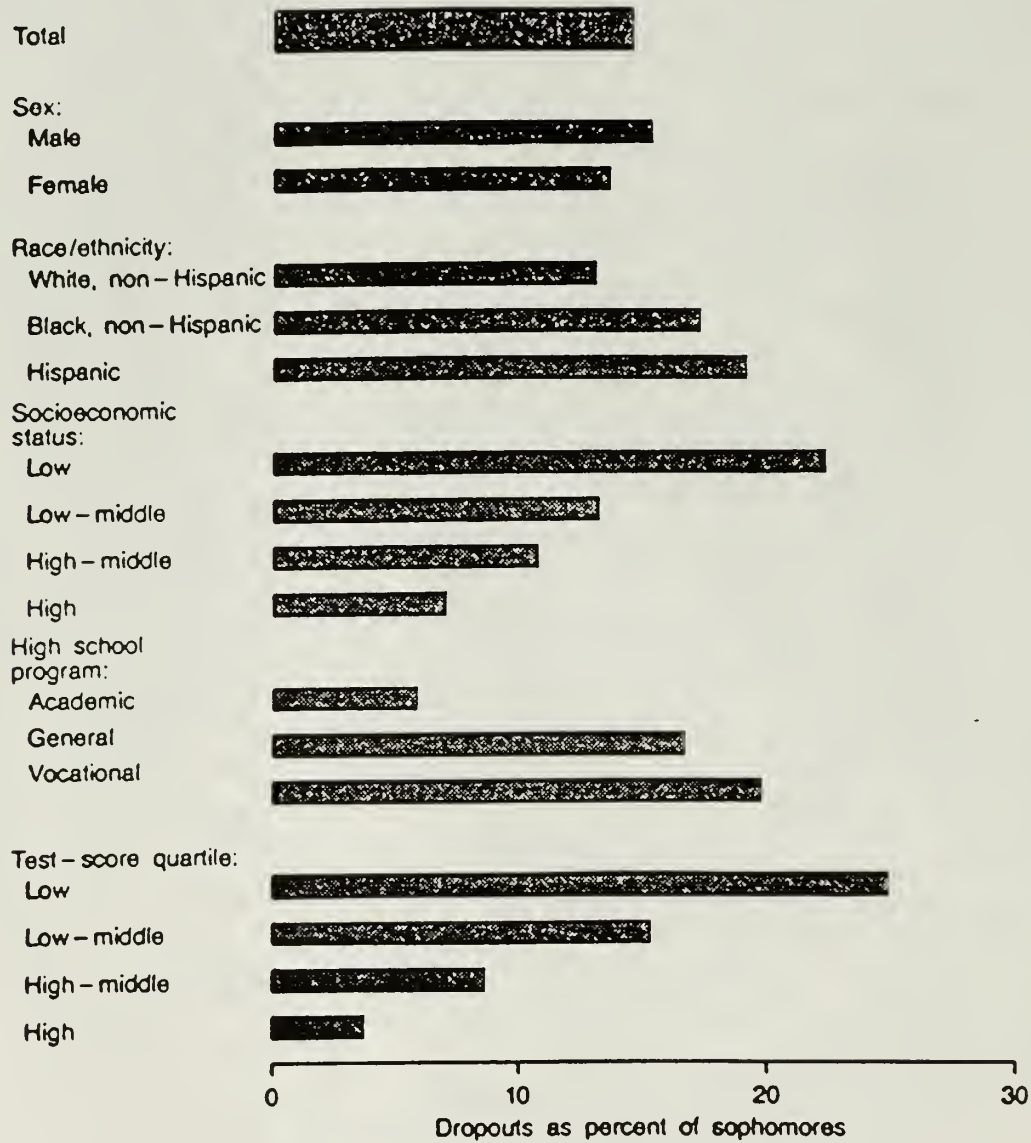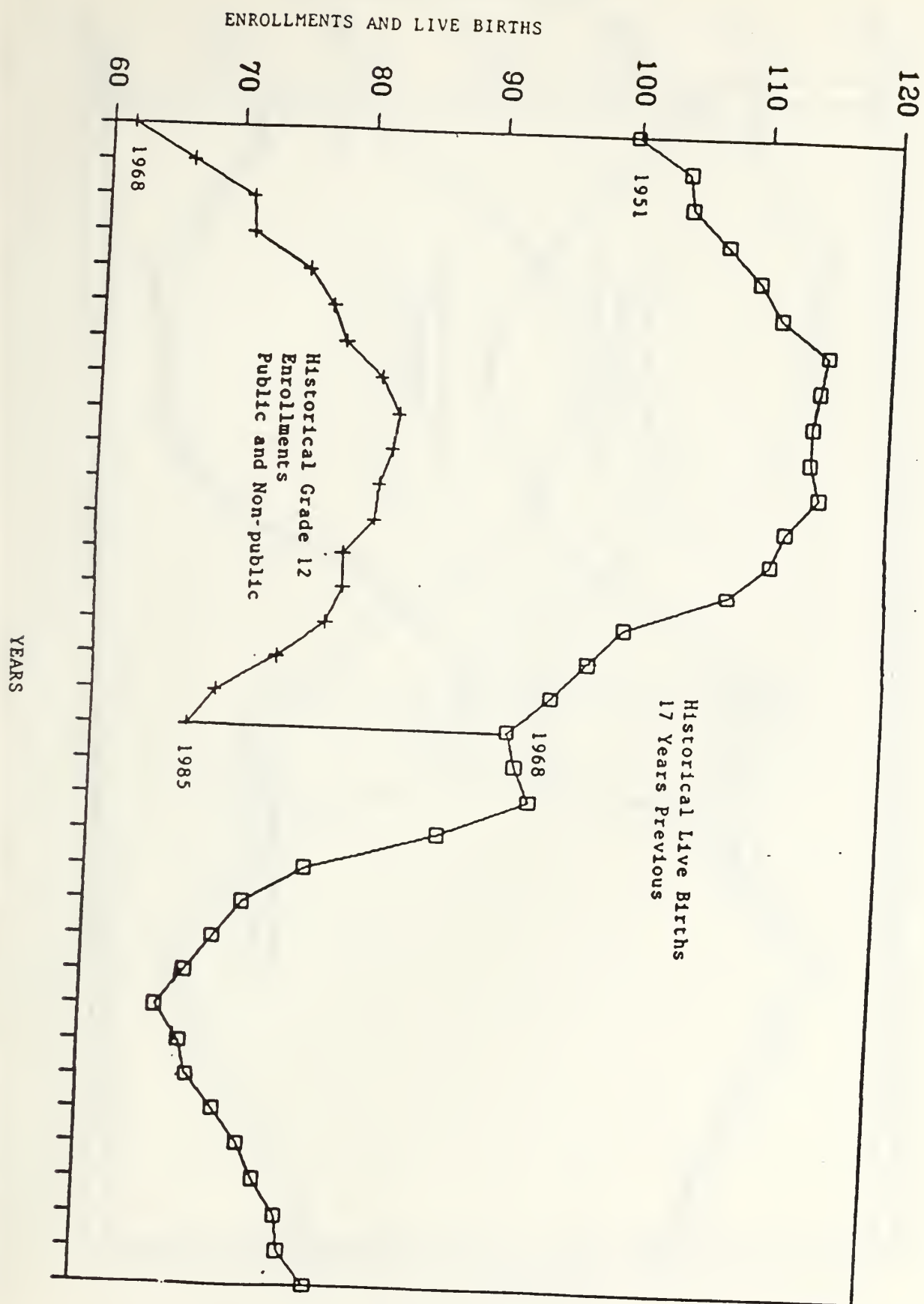
Figure 24

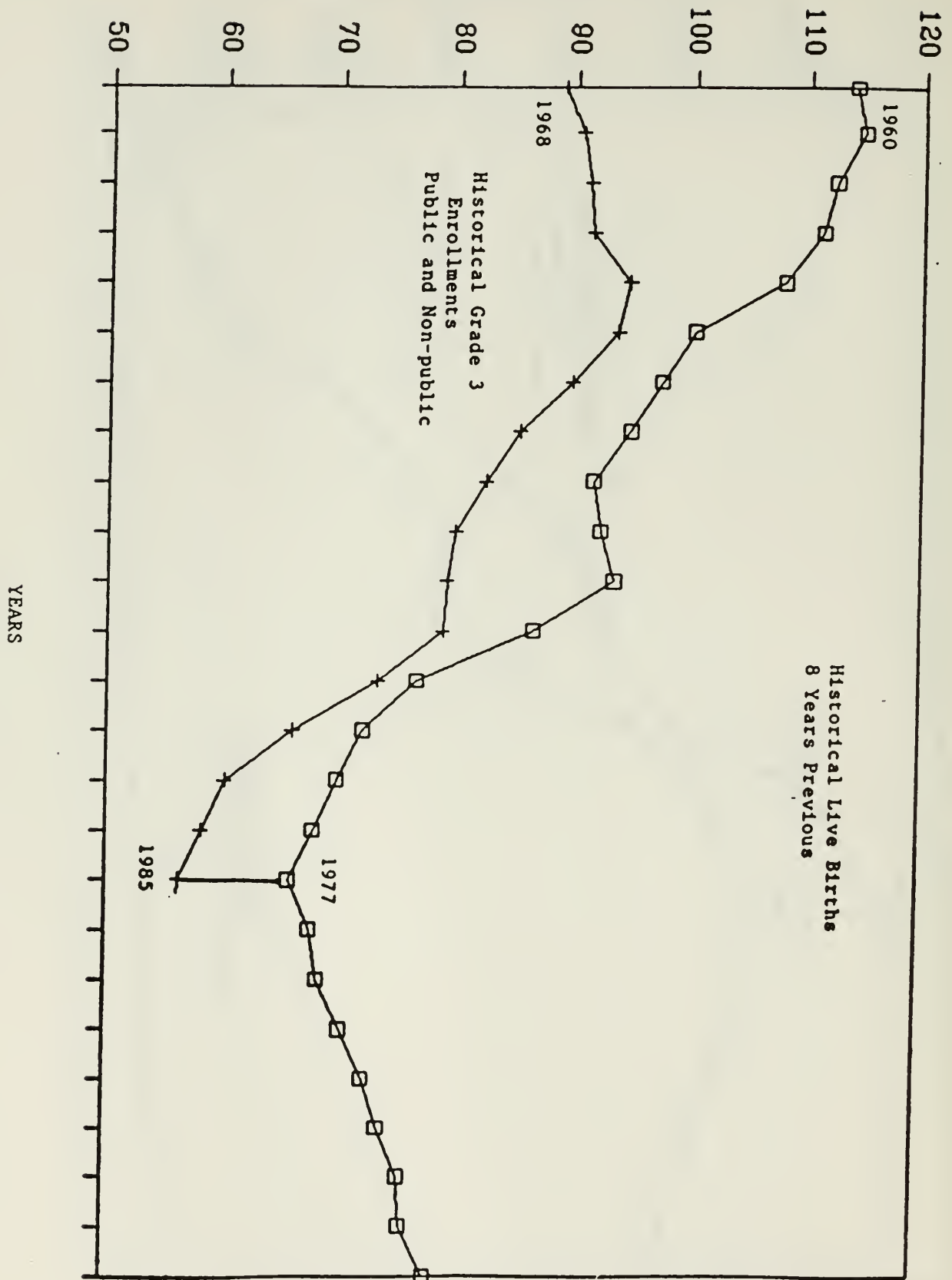ENROLLMENTS AND LIVE BIRTHS
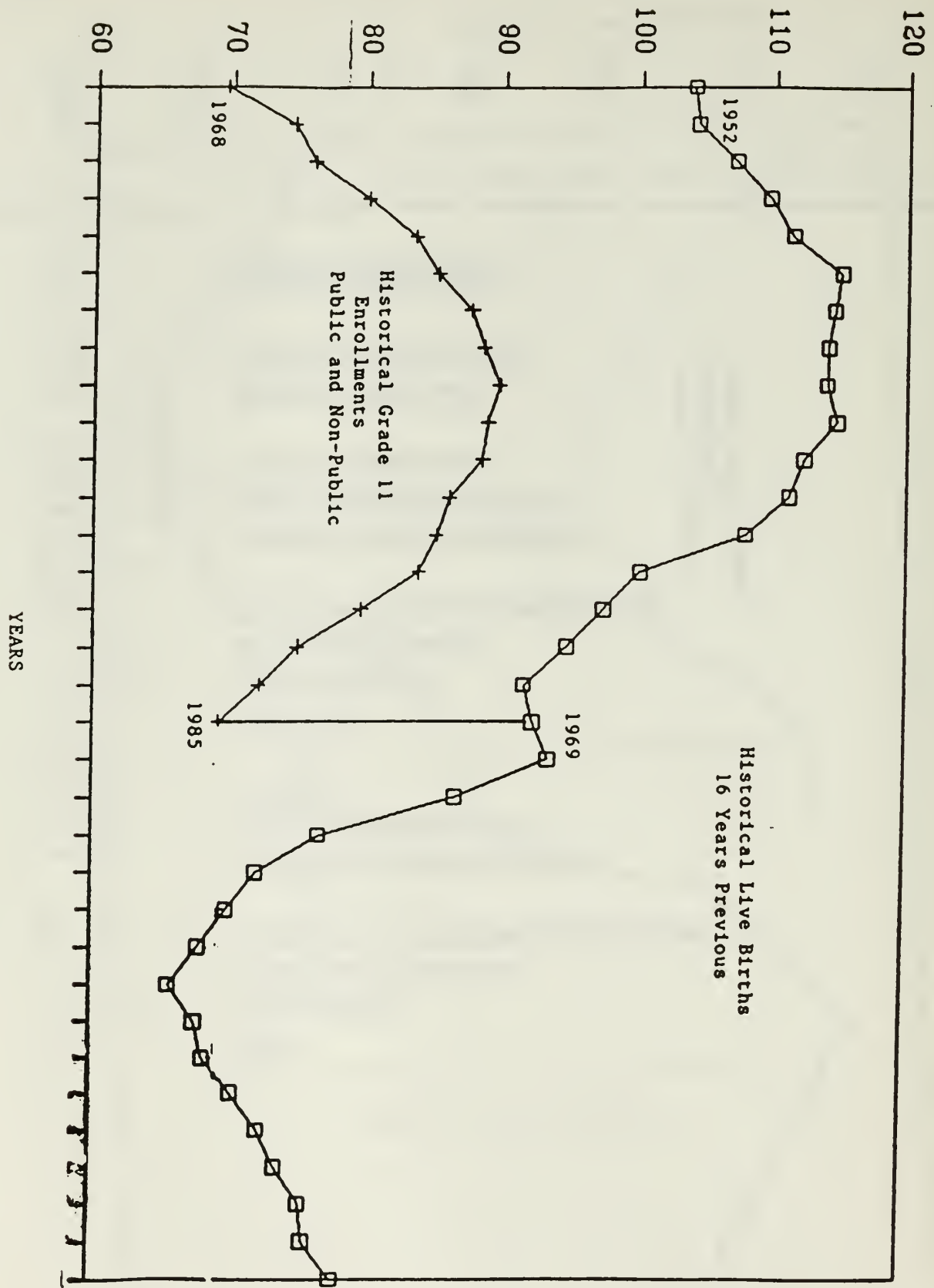
Figure 23

ENROLLMENTS AND LIVE BIRTHS

Historical Grade 10
Enrollments
Public and Non-public

Historical Live Births
15 Years Previous

YEARS

Figure 22

ENROLLMENTS AND LIVE BIRTHS

Historical Grade 9
Enrollments
Public and Non-public

Historical Live Births
14 Years Previous

1968

1985

1971

1954

YEARS
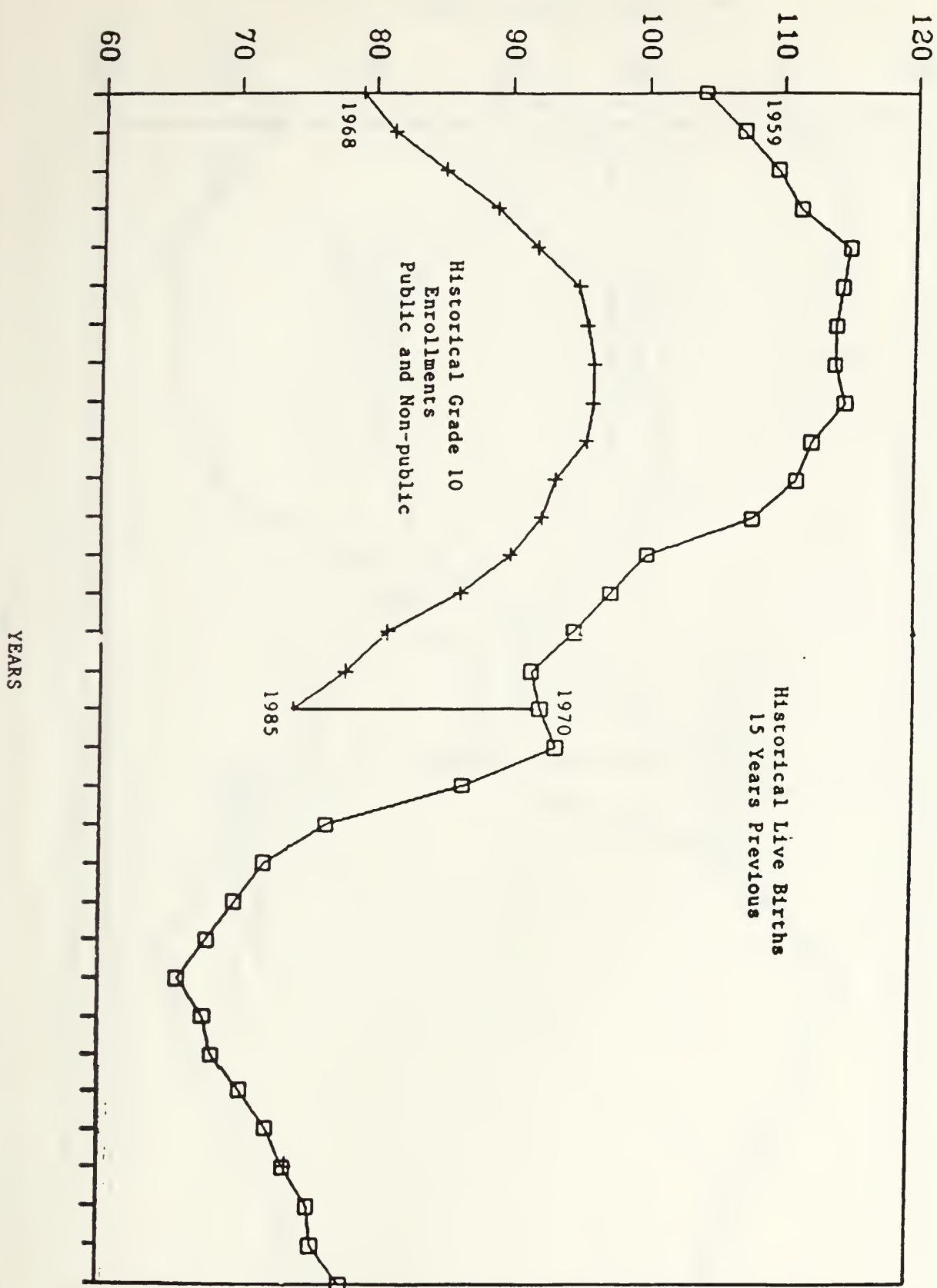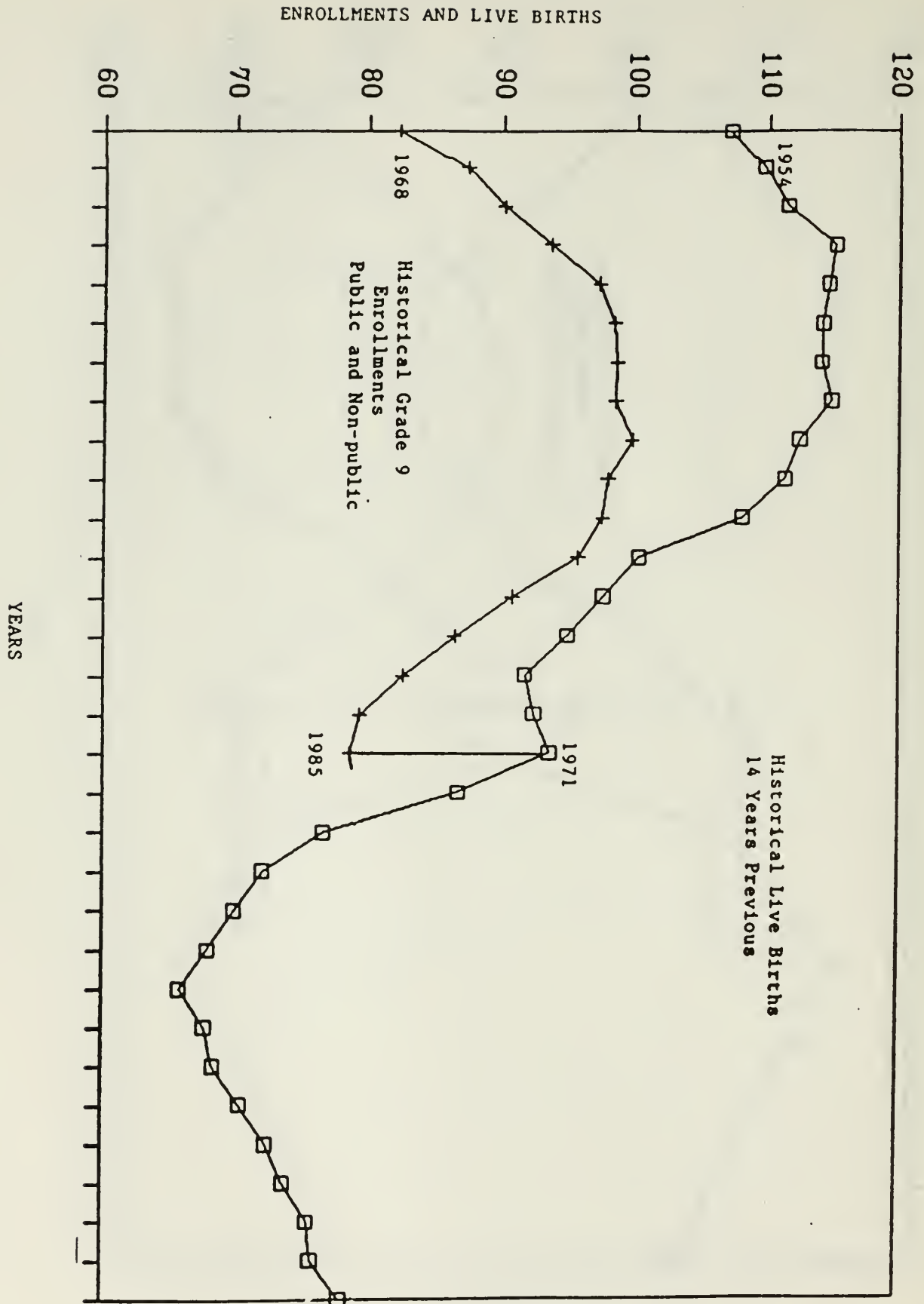
Figure 21

ENROLLMENTS AND LIVE BIRTHS

Historical Grade 8
Enrollments
Public and Non-public

Historical Live Births
13 Years Previous

YEARS

Figure 20

ENROLLMENTS AND LIVE BIRTHS

Figure 19

ENROLLMENTS AND LIVE BIRTHS

Figure 18

A.14
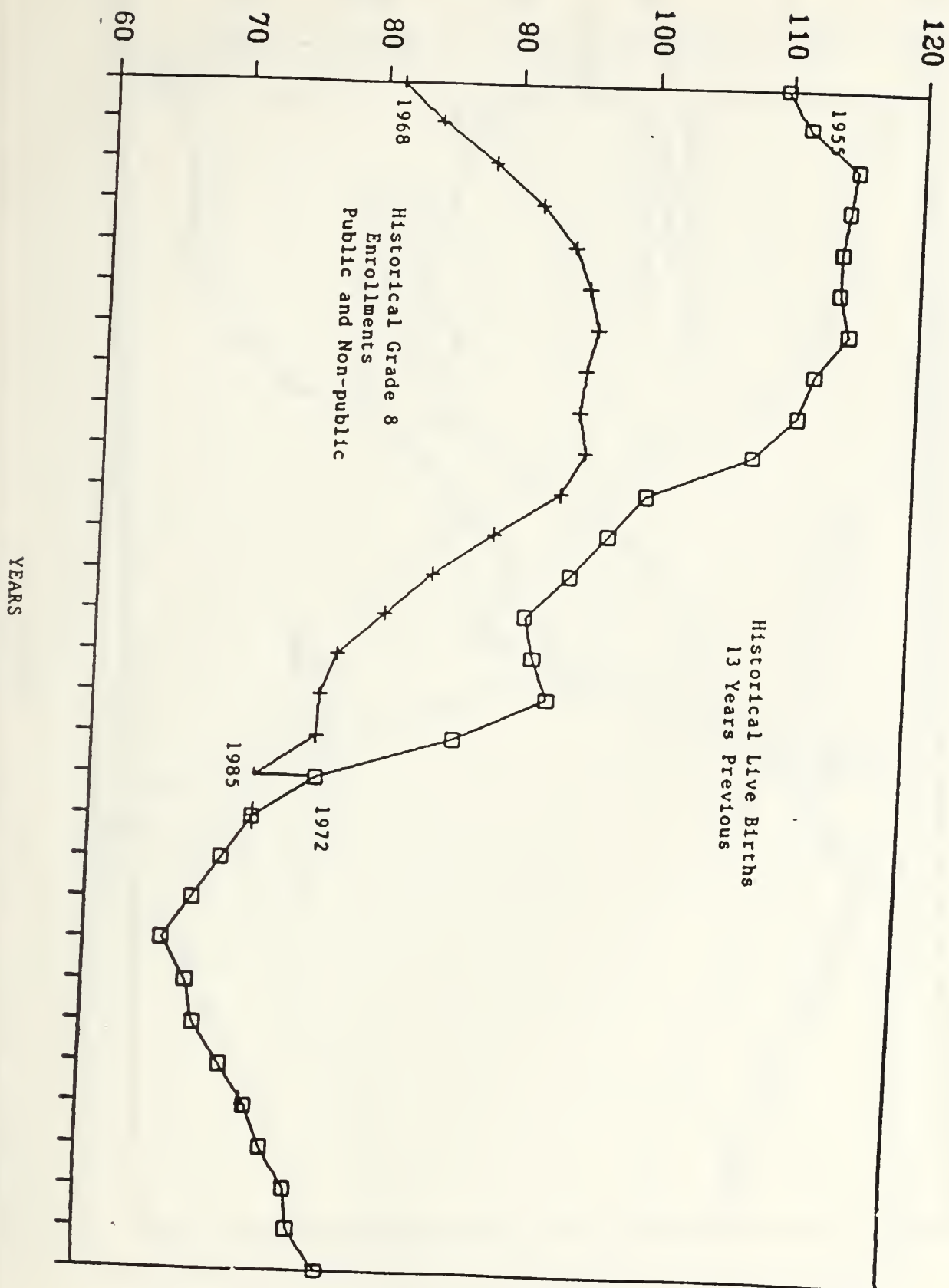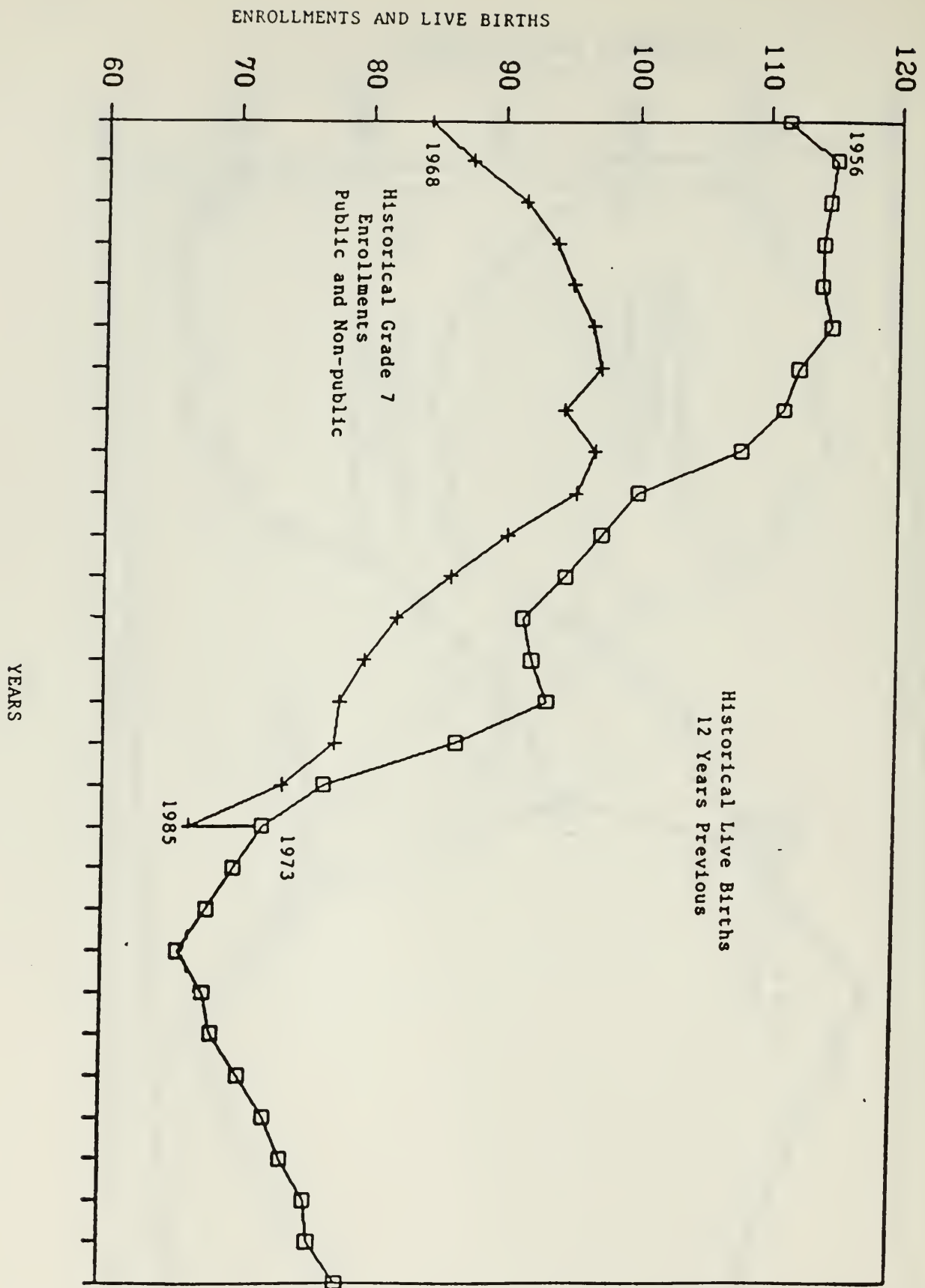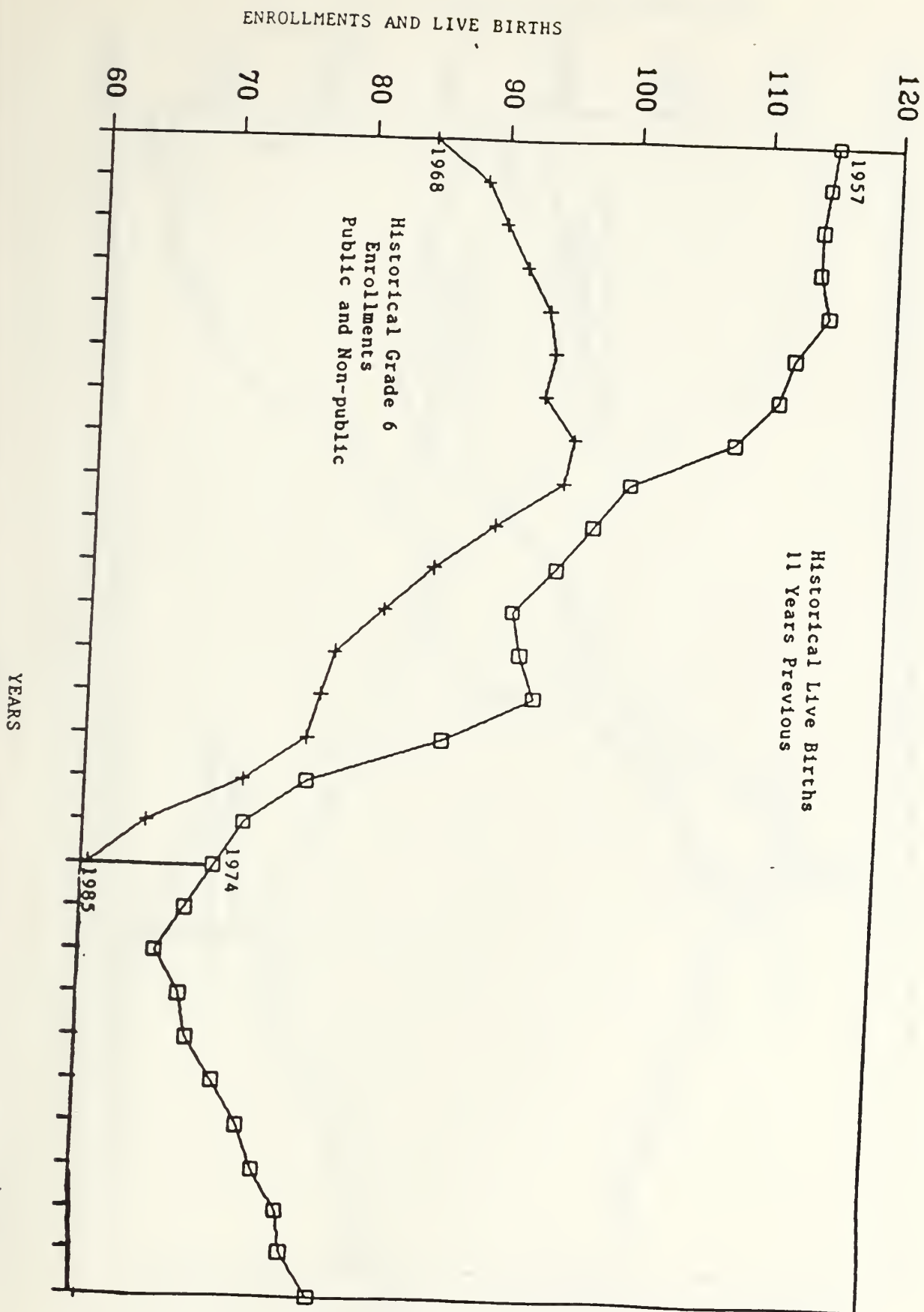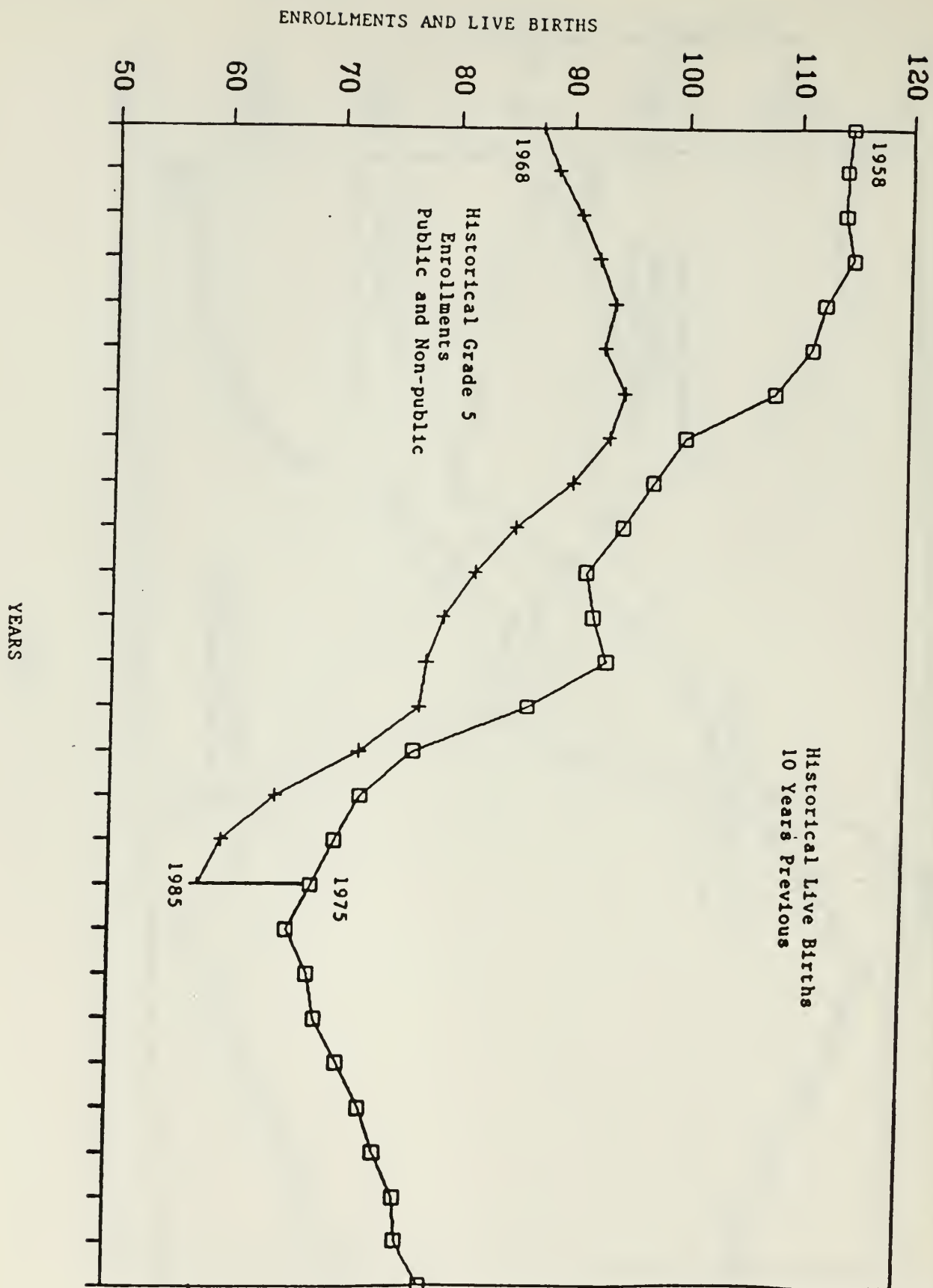
ENROLLMENTS AND LIVE BIRTHS
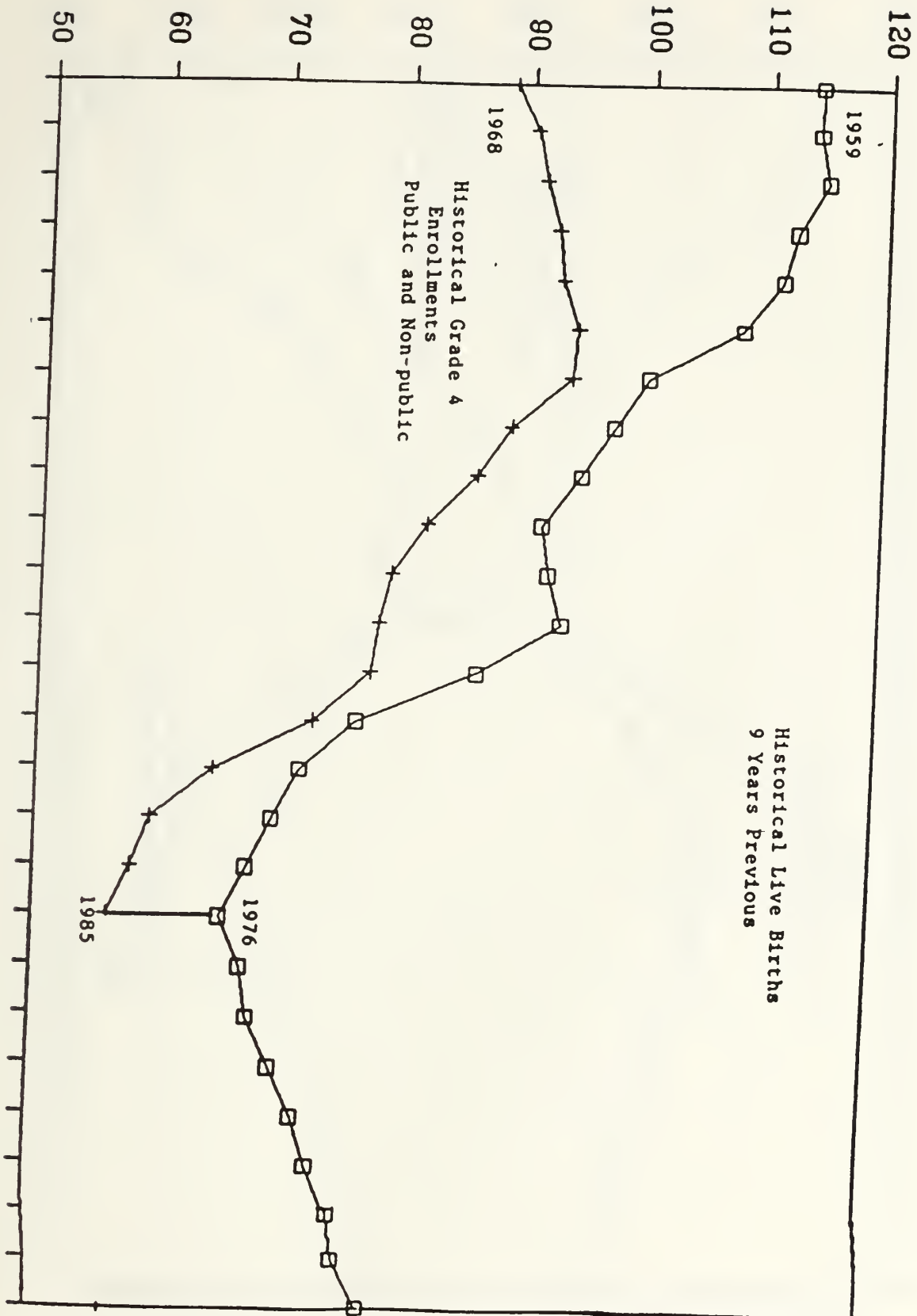
Figure 17

Figure 16

ENROLLMENTS AND LIVE BIRTHS

Figure 15

ENROLLMENTS AND LIVE BIRTHS
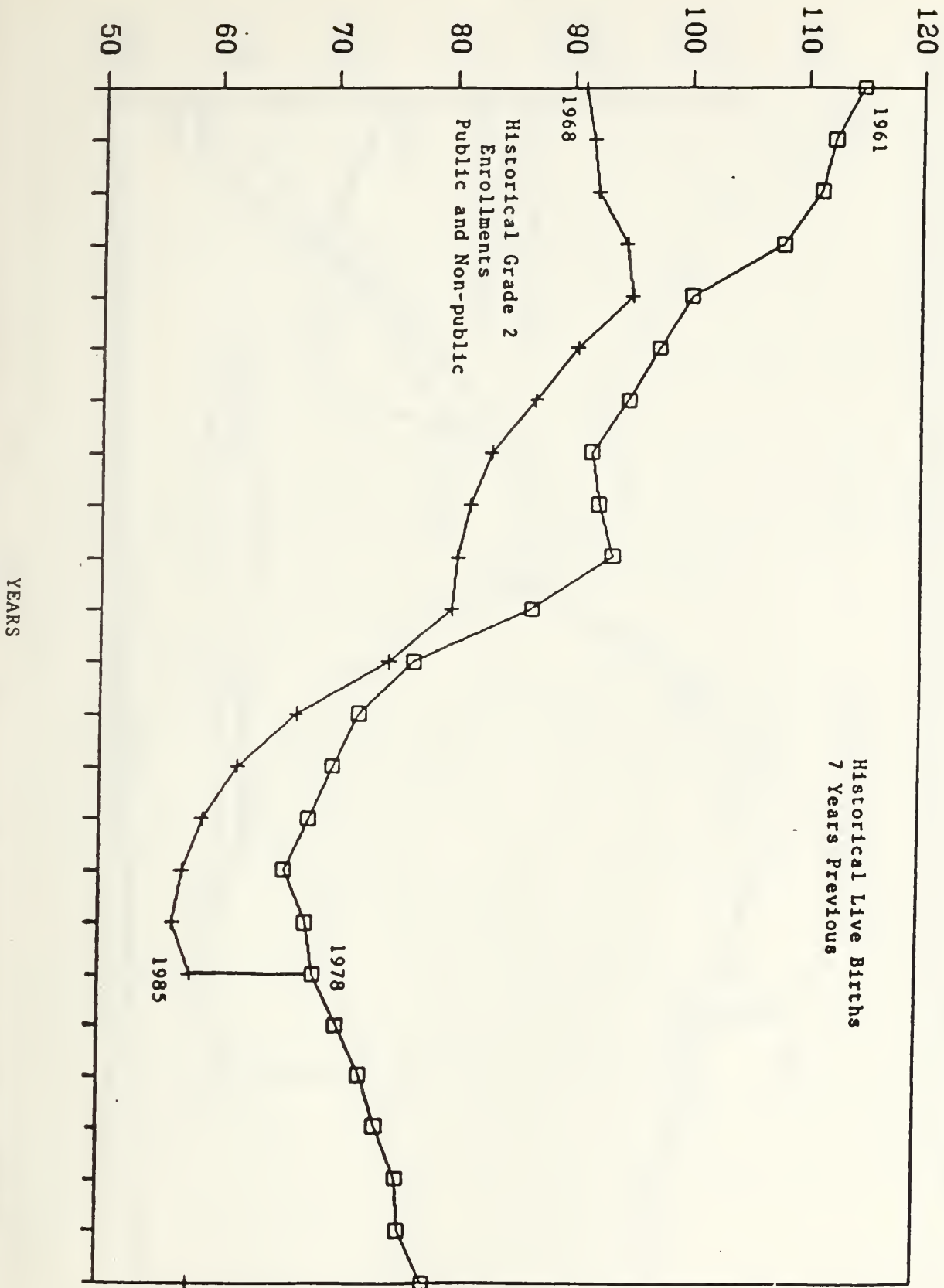
Figure 14
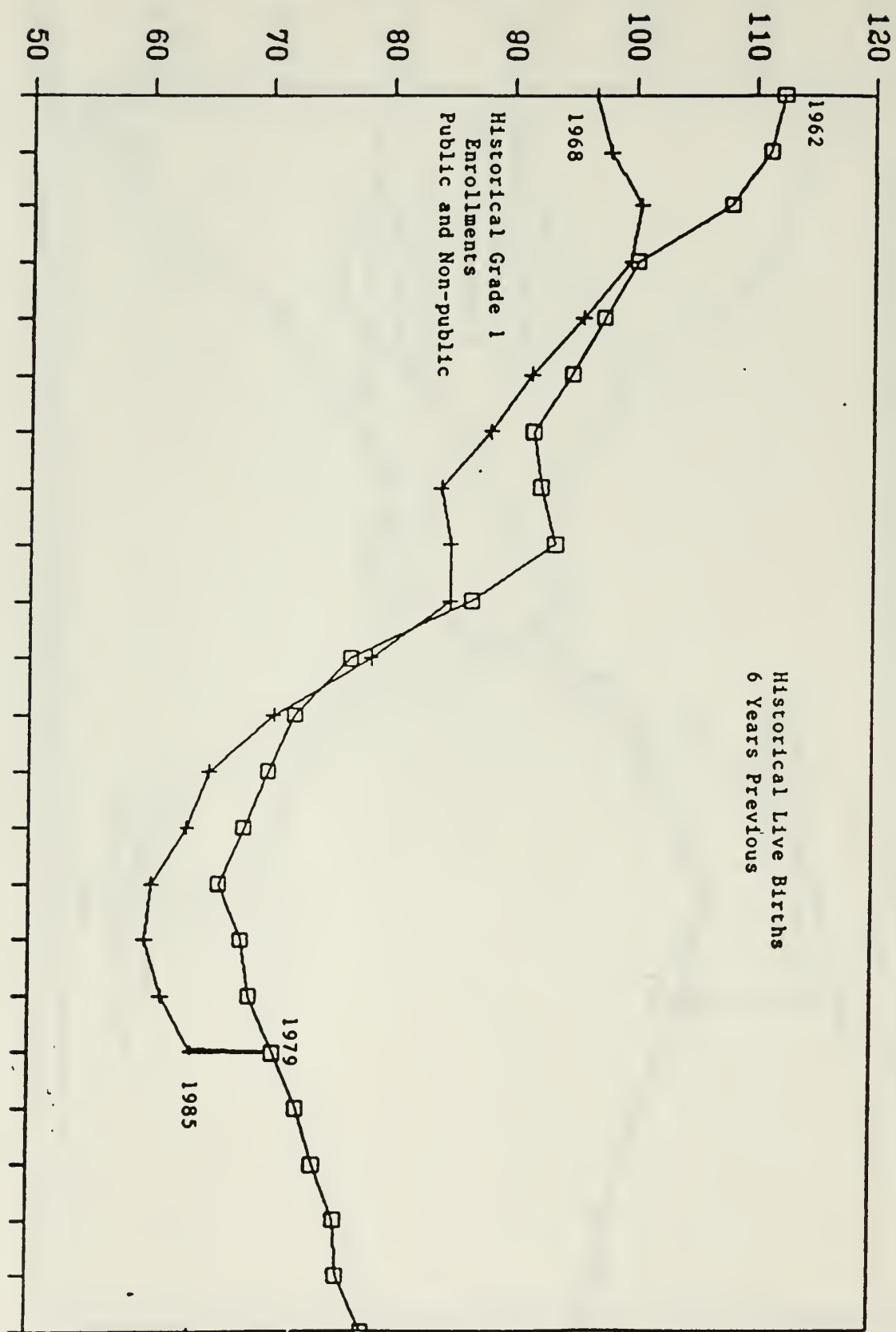
Figure 13

ENROLLMENTS AND LIVE BIRTHS
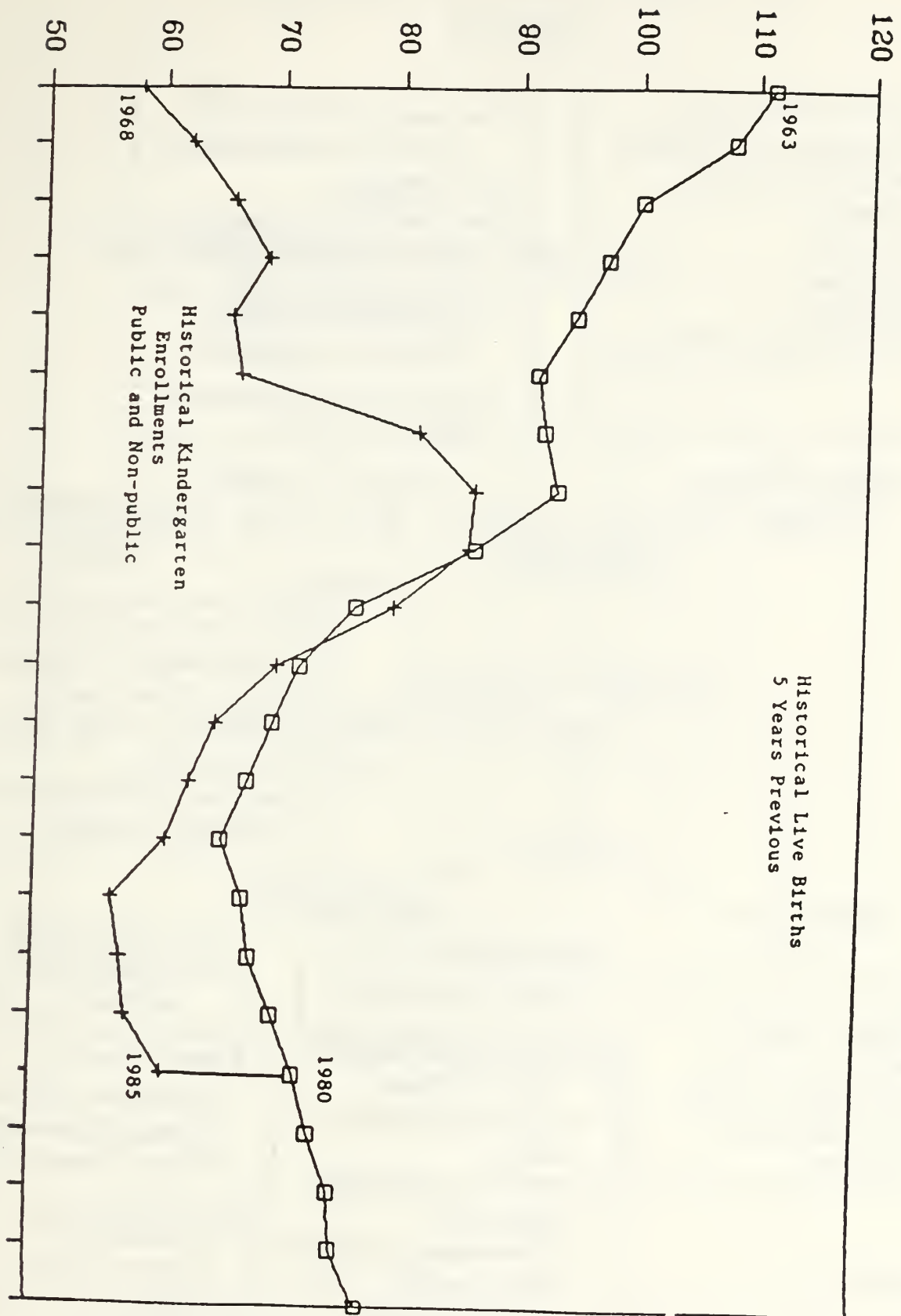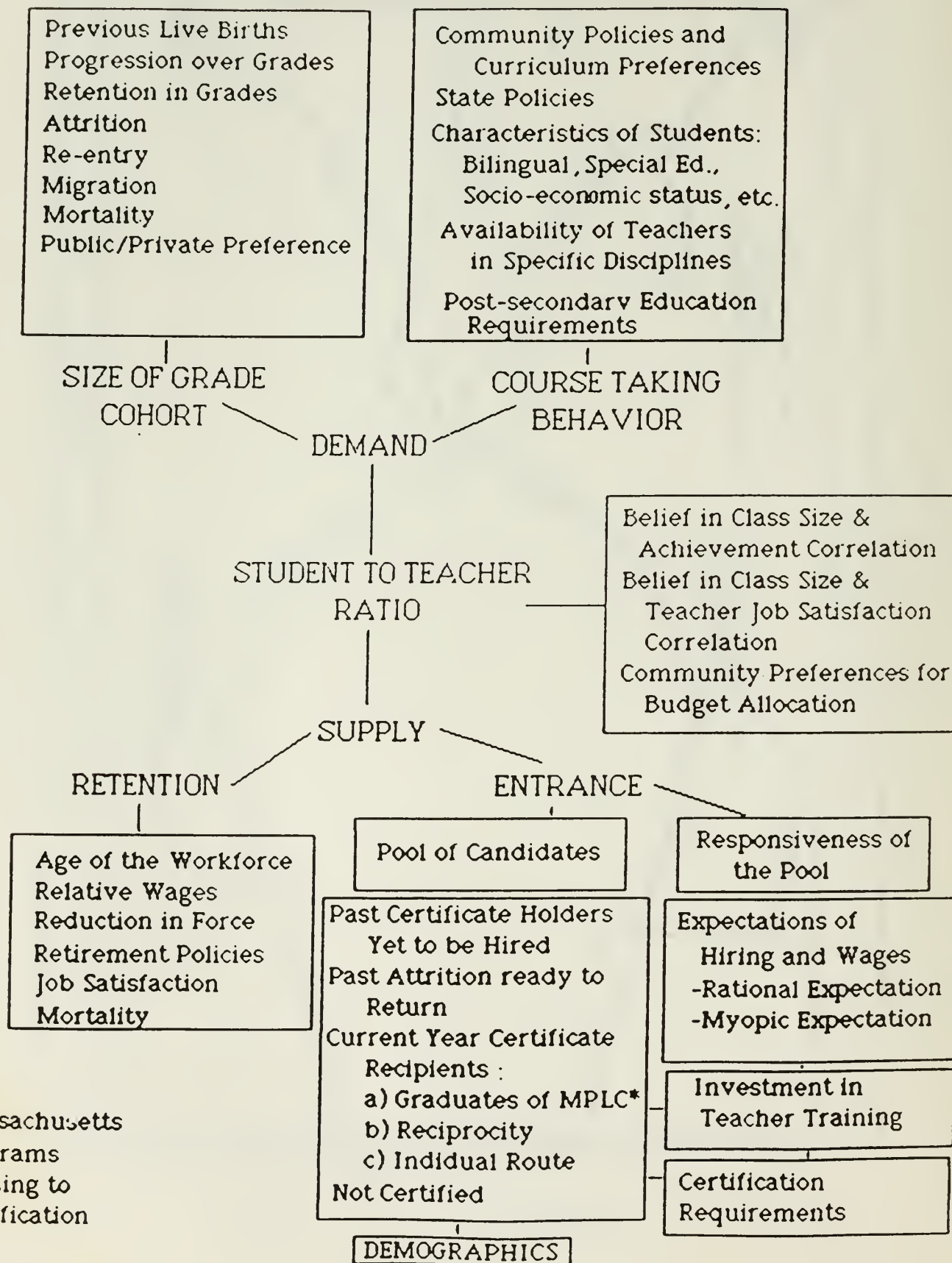

Figure 12

Figure 11

TEACHER SUPPLY & DEMAND SYSTEM

Previous Live Births
Progression over Grades
Retention in Grades
Attrition
Re-entry
Migration
Mortality
Public/Private Preference

Community Policies and
    Curriculum Preferences
State Policies
Characteristics of Students:
    Bilingual, Special Ed.,
    Socio-economic status, etc.
Availability of Teachers
    in Specific Disciplines

Post-secondary Education
    Requirements

SIZE OF GRADE
COHORT

COURSE TAKING
BEHAVIOR

DEMAND

STUDENT TO TEACHER
RATIO

Belief in Class Size &
    Achievement Correlation
Belief in Class Size &
    Teacher Job Satisfaction
    Correlation
Community Preferences for
    Budget Allocation

SUPPLY

RETENTION

ENTRANCE

Age of the Workforce
Relative Wages
Reduction in Force
Retirement Policies
Job Satisfaction
Mortality

Pool of Candidates

Responsiveness of
the Pool

Past Certificate Holders
    Yet to be Hired
Past Attrition ready to
    Return
Current Year Certificate
    Recipients :
    a) Graduates of MPLC*
    b) Reciprocity
    c) Indiual Route
Not Certified

Expectations of
    Hiring and Wages
    -Rational Expectation
    -Myopic Expectation

Investment in
Teacher Training

Certification
Requirements

*Massachusetts
Programs
Leading to
Certification

DEMOGRAPHICS

Figure 10

TEACHER SUPPLY & DEMAND
COMPONENTS

SIZE OF GRADE
COHORT

COURSE TAKING
BEHAVIOR

DEMAND

STUDENT TO TEACHER
RATIO

SUPPLY

RETENTION

ENTRANCE

Table 2.

TOTAL TEACHER EMPLOYMENT

YEAR	WORKFORCE	RETAINED	ENTRANTS	ATTRITION
1974	71764	64175	7589	6178
1975	72641	66443	6198	5314
1976	72768	67286	5482	5347
1977	73559	67793	5766	4970
1978	72824	67575	5249	5975
1979	71889	66980	4909	5830
1980	70648	66195	4453	5679
1981	64013	61123	2890	9509
1982	62912	58715	4197	5290
1983	62547	58673	3874	4228
1984	62660	58447	4213	4084
1985	62225	58290	3935	4361

Table 1

ENTRANCE AND ATTRITION

YEAR	ENTRANCE	ATTRITION	RATIO
1974	7589	6178	1.22
1975	6198	5314	1.16
1976	5482	5347	1.02
1977	5766	4970	1.16
1978	5249	5975	0.87
1979	4909	5830	0.84
1980	4453	5679	0.78
1981	2890	9509	0.30
1982	4197	5290	0.79
1983	3874	4228	0.91
1984	4213	4084	1.03
1985	3935	4361	0.90

Figure 9

TOTAL RETENTION IN THE WORKFORCE 1974-85
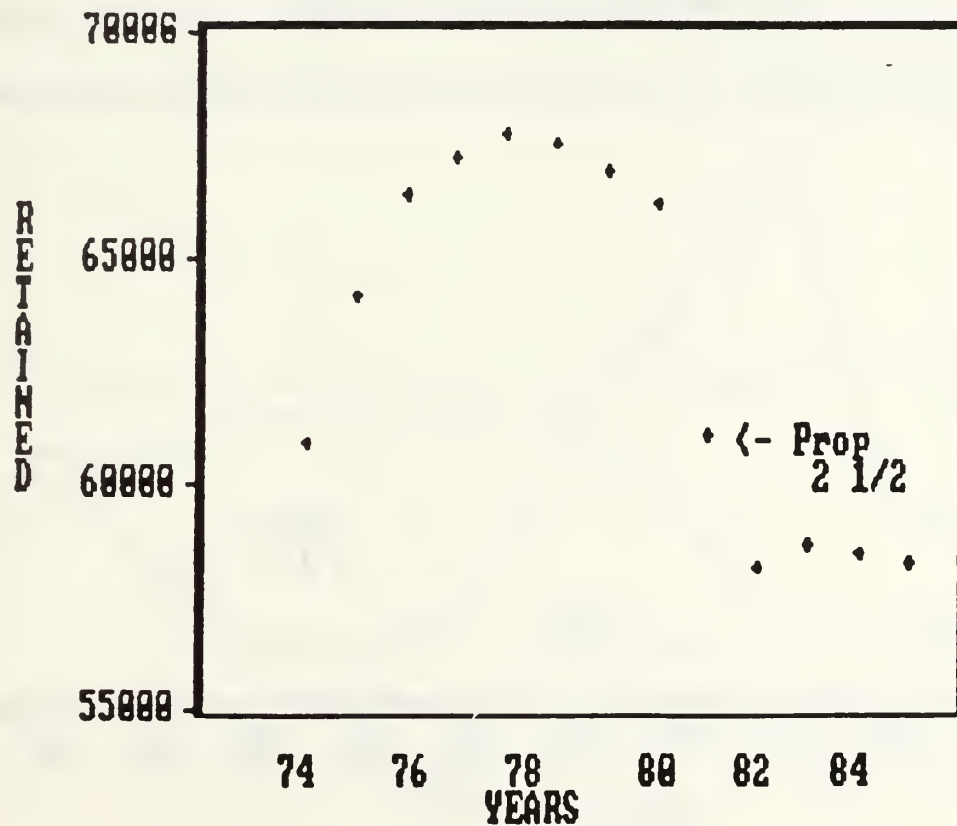
Figure 7

RATIO OF TOTAL ENTRANCE TO TOTAL ATTRITION: 1974-1985

At 1.00 Entrance=Attrition

<- Prop 2 1/2
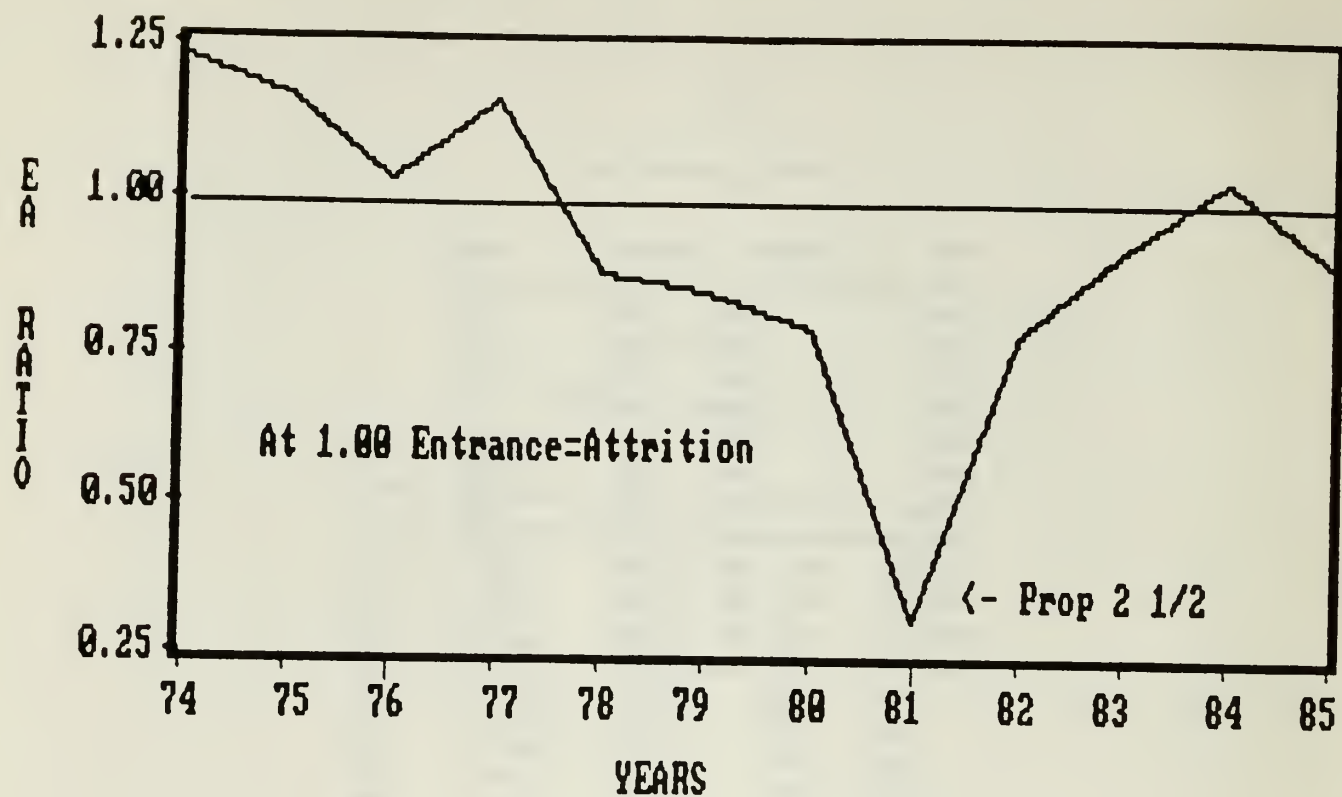
Figure 8

UNEMPLOYMENT IN MASSACHUSETTS

PROP.
2 1/2 -->

___ EMP
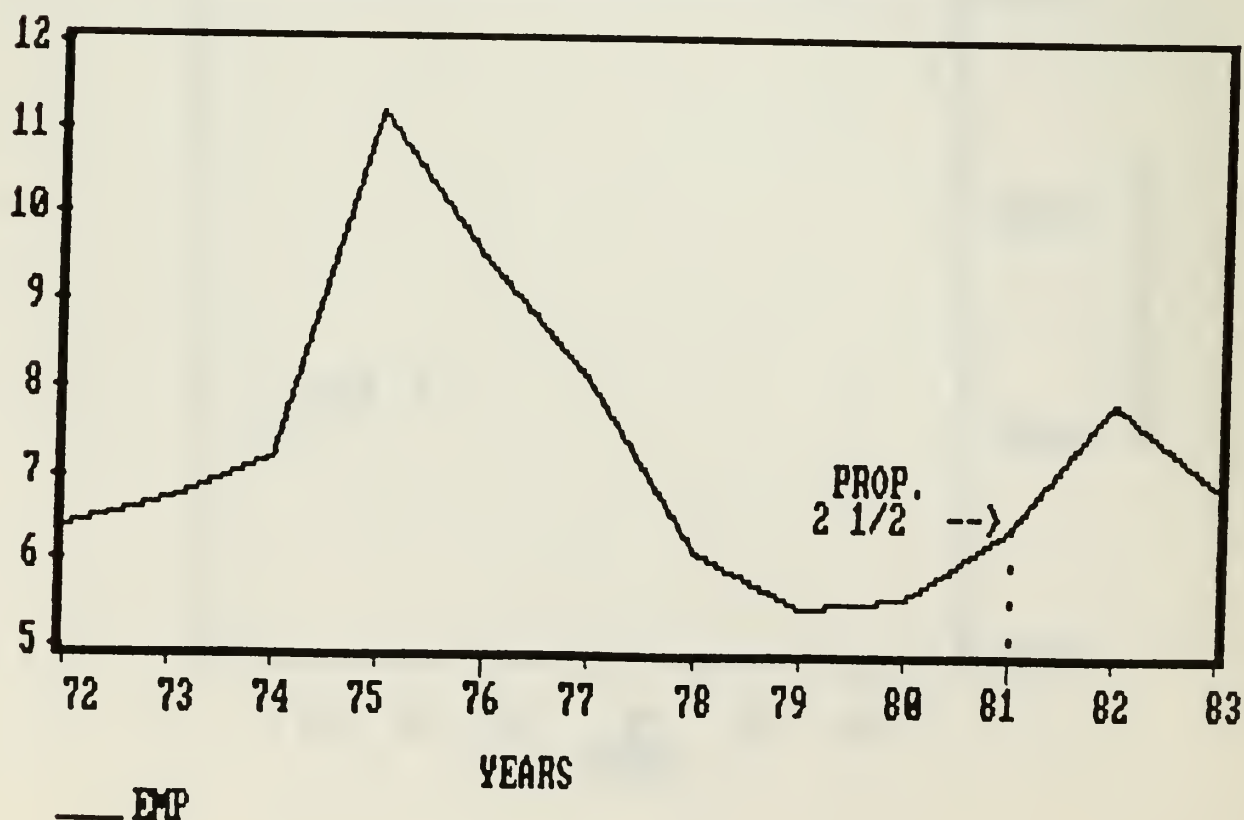
Figure 5

TOTAL ENROLLMENT TO TOTAL EMPLOYMENT RATIO
1973 TO 1985
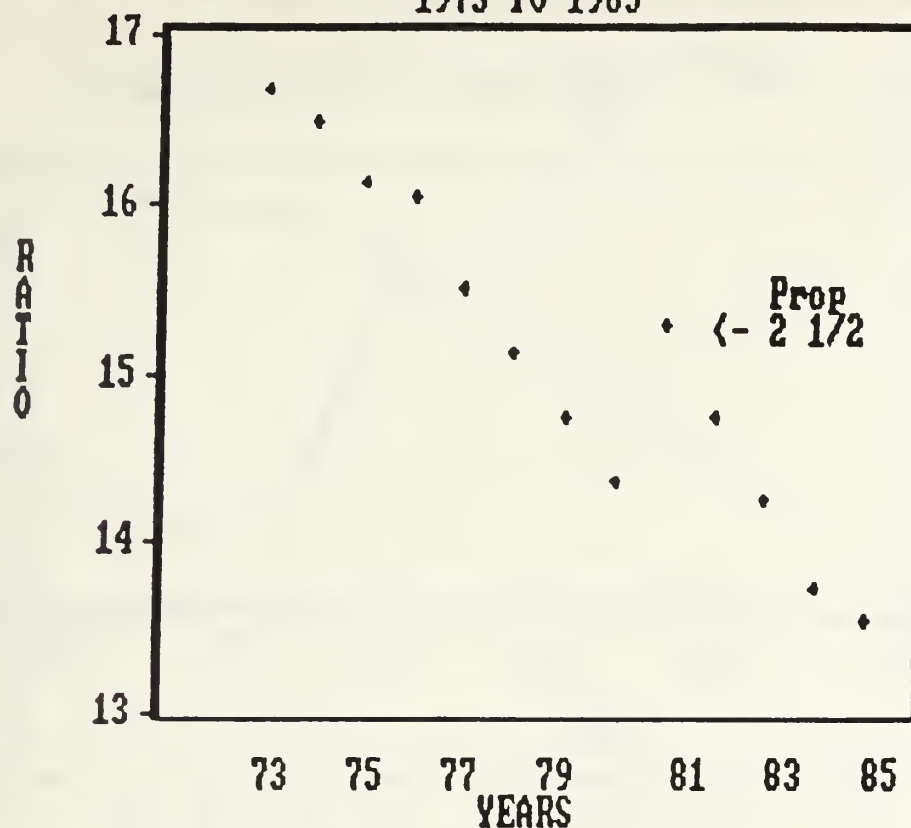
Figure 6

TOTAL RETAINED, HIRED, AND STOPOUTS RETURNING: 1973-1985

_____ RETAINED   .... HIRED   _ _ _ STOPOUTS
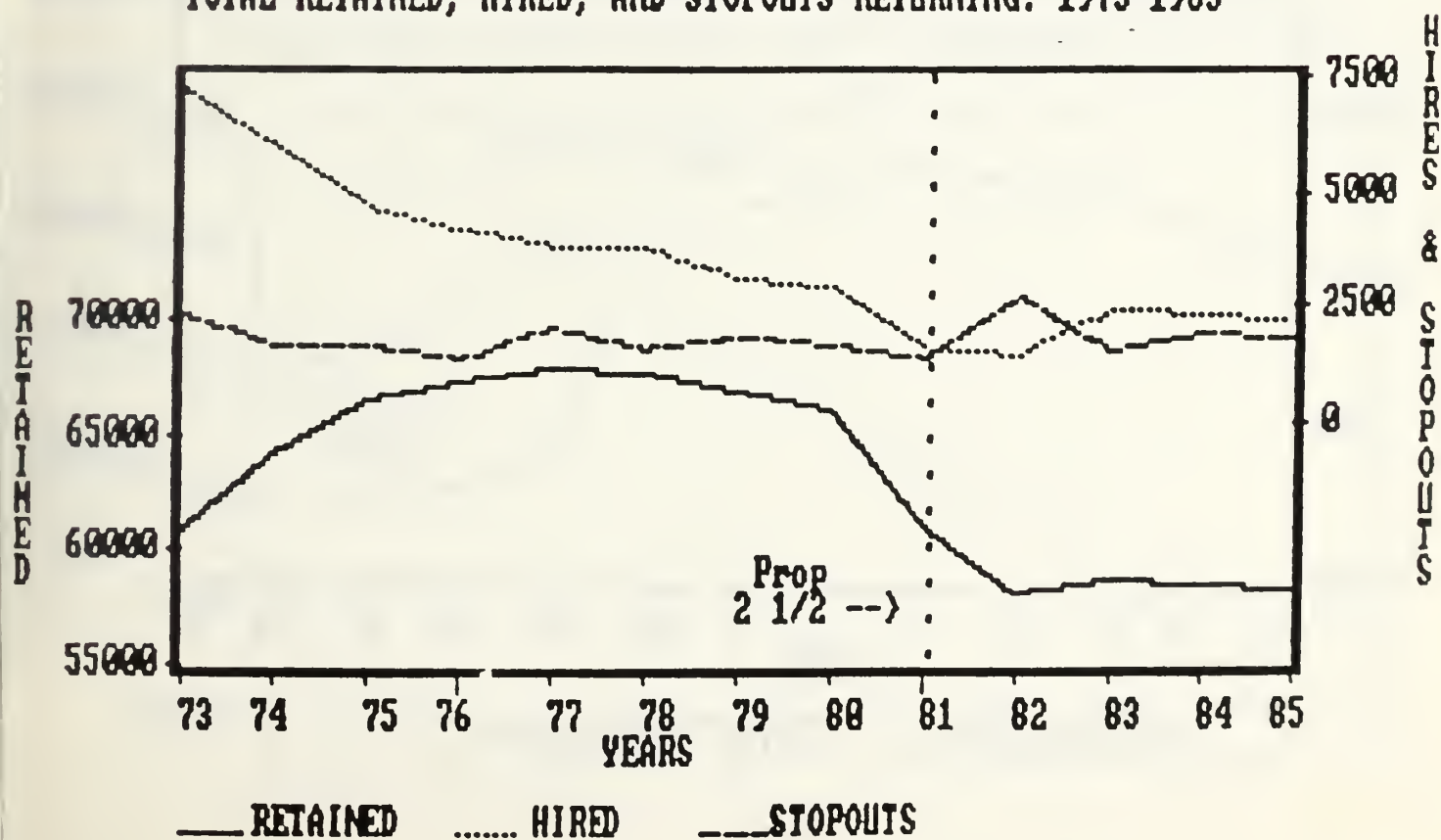
Figure 3

LIVE BIRTHS IN MASSACHUSETTS: 1950 TO 1984
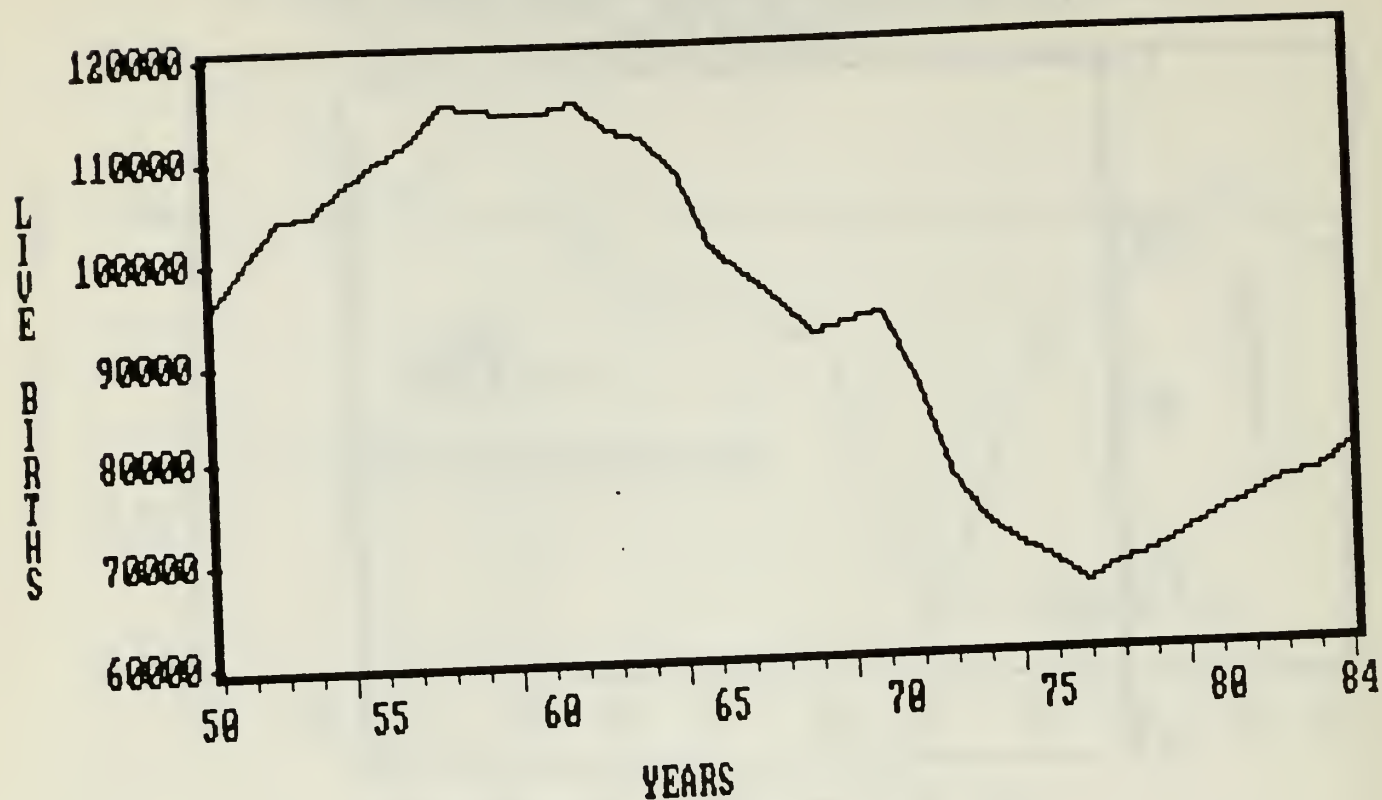
Figure 4

TOTAL WORKFORCE AND TOTAL ENROLLMENTS: 1973 TO 1985

_____ TOTAL WORKFORCE ......TOTAL ENROLLMENTS
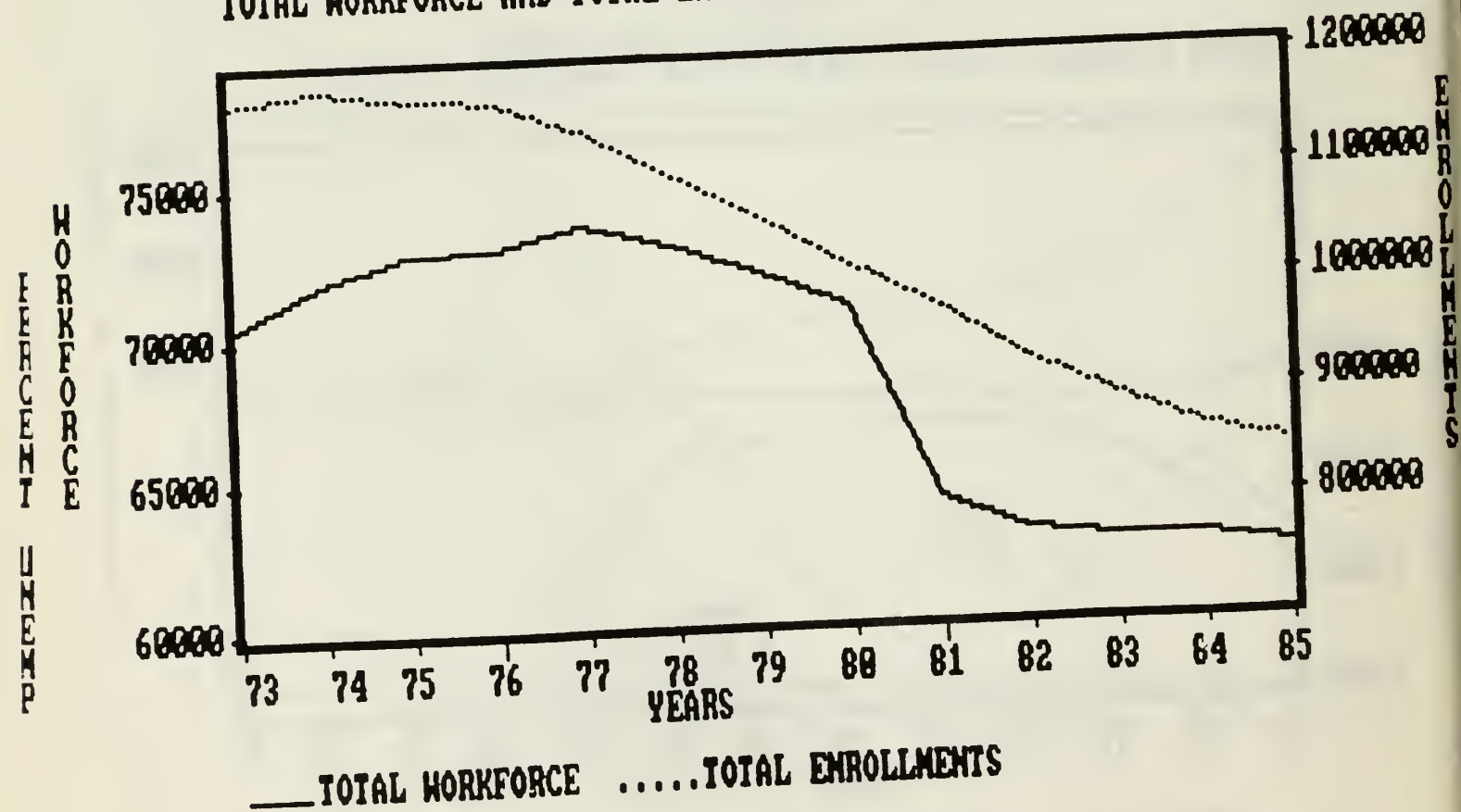
Figure 1

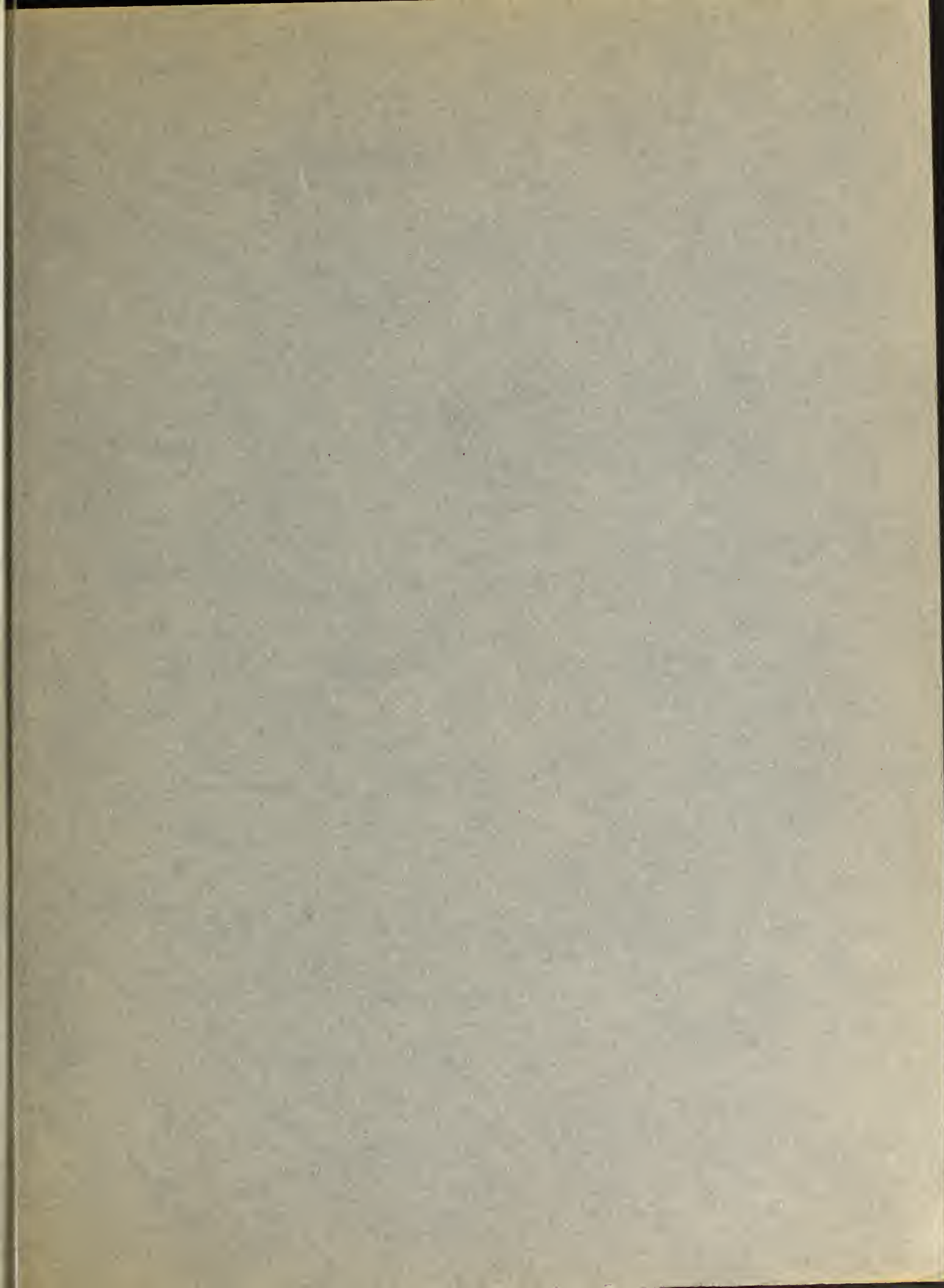# TOTAL PUBLIC SCHOOL ENROLLMENTS: 1973 TO 1985
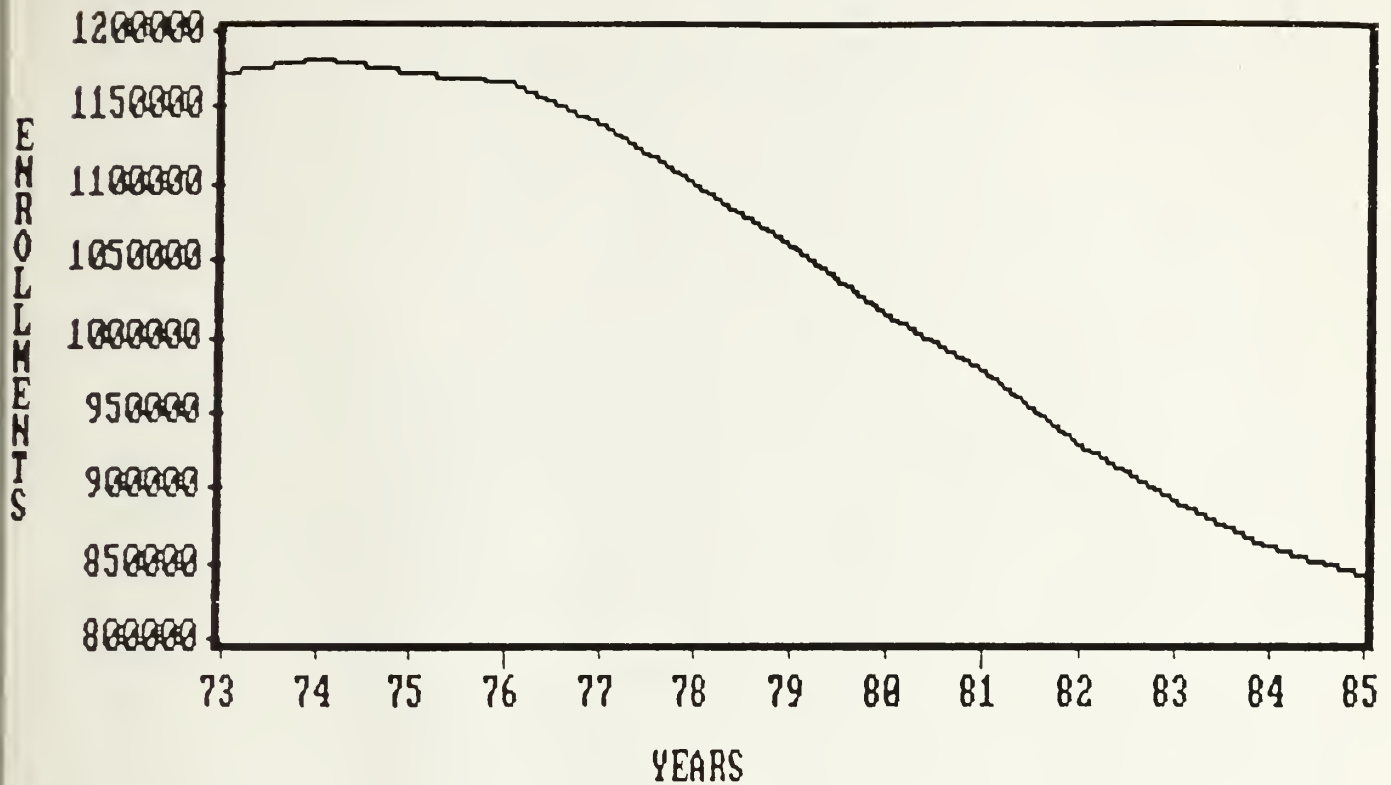
Figure 2

PRIMARY AND SECONDARY PUBLIC SCHOOL ENROLLMENTS: 1973 TO 1985
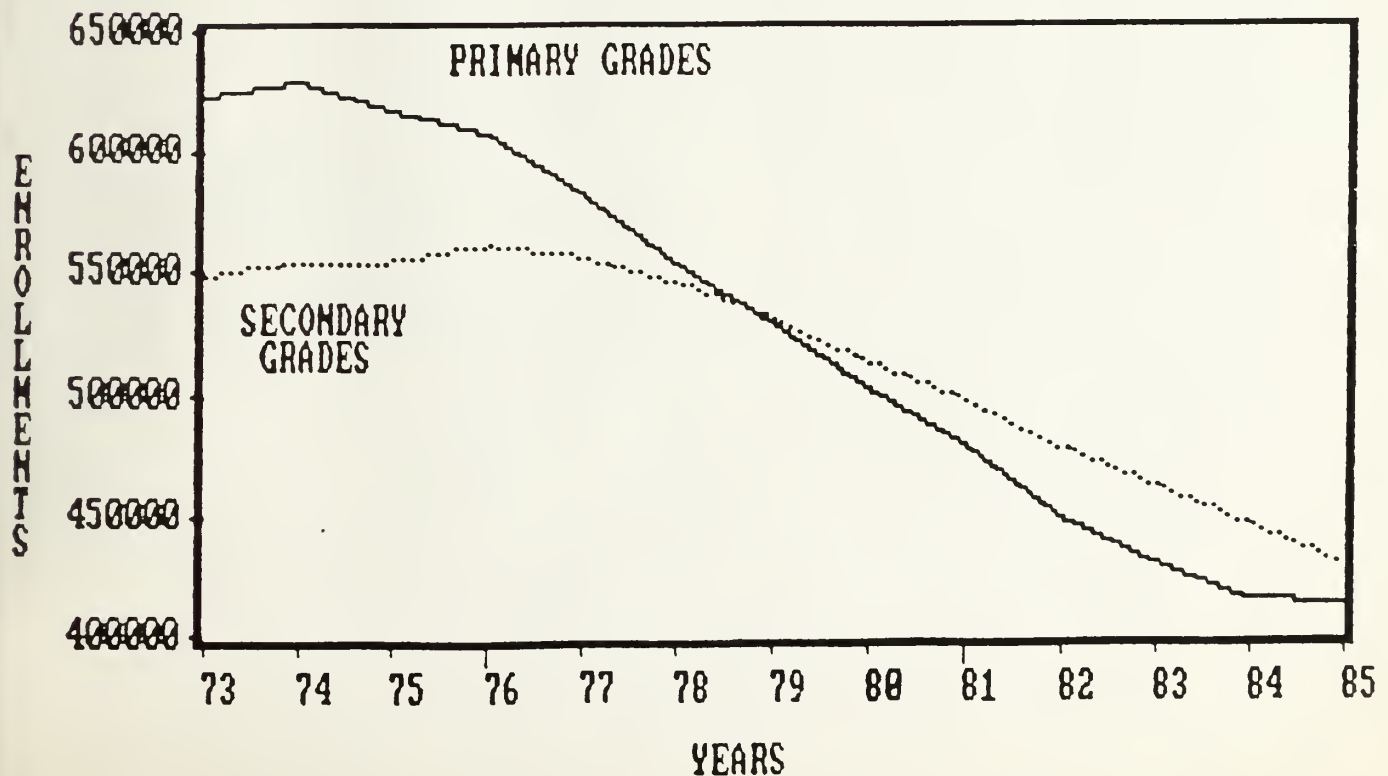
REPORT ON THE STATUS OF
TEACHER SUPPLY AND DEMAND IN MASSACHUSETTS

Tables and Figures

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